

DISSECTION GUIDES

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DISSECTION GUIDES.



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DISSECTION GUIDES,

AIMING AT EXTENDING AND FACILITATING

SUCH PRACTICAL WORK IN ANATOMY

AS WILL BE SPECIALLY USEFUL

In connection with an Ordinary Hospital Curriculum.

BY

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"Dissect well and quickly."

"Dissecting should be a fascinating pursuit."

Introduction, page 11.

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PREFACE.

This is a book of methods, not a systematic treatise.

Hence various omissions: things believed to be familiar to the average dissector have been left out.

Hence, again, the supplementary character common to the 'Guides' and to the 'Tablets.'

The methods submitted are based upon a careful study of the several parts of the body *from the dissector's point of view*. They have been slowly elaborated by daily dissections extending over many long years.

They aim at enabling the dissector to make the best and most lasting use of each part he dissects. It will be noticed that the dissections are so planned as to allow the dissector to get down to the bones and ligaments *without removing the superficial structures*, — all structures, both superficial and deep, being thus preserved for after-study.

As a book of methods, this is necessarily built up somewhat on the lines of the 'Handbook of the Physiological Laboratory.'

In physiology, we have been benefiting greatly for now some twenty years by the extension of practical work initiated by the authors of the above remarkable treatise.

No corresponding progress has, however, been made in anatomy. Admirable as are the works of Ellis, Heath, & Holden, they cannot be considered to correspond, in anatomy, to, in physiology, the 'Handbook.' They profess, in fact, to combine two things, – descriptions of the structures exposed, and rules for exposing them, – the latter being necessarily brief, and more or less overshadowed by the more voluminous descriptive element.

The immediate object of the present opuscle is to dissociate the two elements hitherto combined, with a view to giving the dissector that help which he requires in the dissecting-room more fully than has hitherto been done, – as fully, indeed, it is hoped, as may be consistent with individual effort on the part of the learner.

The kind of anatomy aimed at in these pages, – and, indeed, though less visibly so, in the author's other publications, – is that thorough practical acquaintance with the human body, which is comparable to everyone's knowledge of the locality in which he lives, – comparable, indeed, to the young gutter urchin's knowledge of the yards, alleys, lamp-posts, door-steps, knockers, and key-holes of the narrow precincts in which his lot is cast, – to whom the very paving stones are familiar, which he treads with his naked feet.

Knowledge of this kind is only to be obtained by careful & repeated dissections.

But for repeated dissections to be possible in the present congested state of the medical curriculum, the student must learn to dissect both efficiently and without loss, – *i.e.*, unnecessary expenditure, – of time; he must learn to dissect well and quickly.

The author's endeavour is to teach him to do this.

Some effort of the kind seemed called for.

With the increased pressure in various directions, which marks the present epoch, we seem threatened more and more every year with a serious decline of practical work in anatomy. It scarcely covers the ground to say that we no longer dissect as we used to, – and should, if the old standards of practical surgery are to be maintained. A kind of theoretical or black-board anatomy seems to be taking the place of the old practical work; the object, of some at least, being apparently to form mental pictures of things, – a kind of aerial embodiment of words learnt more or less by heart, – and by means of which *the words* may the more easily be remembered for a given time.

The remedy submitted is not an untried one, at least in the small area of the author's more immediate surroundings. The present 'Guides' are but an expansion of leaflets of similar design, which have been in constant use for many years in the author's dissecting-room, and which are believed to have helped many.

It will be noticed that little has been said about skin incisions. The author dreads transverse incisions as exposing superficial structures to unintentional division. Longitudinal incisions, if long enough, can usually take their place; and these are best left, in the author's estimation, to the common sense of the dissector.

INTRODUCTION.

ON THE ART OF DISSECTING.

I.

What is it that makes certain dissections more difficult than others? All will agree, for example, that a leg is harder to dissect than an arm; but why is this?

What is it, speaking generally, that makes a dissection difficult? Is it the small size of the structures prevalent in certain parts of the body? No. Parts—the limbs especially, and more particularly the nerves of the limbs—are as easy, or more easy, to dissect in the fœtus than in the adult. Is it the large number of structures crowded together in a small space? No. Average dissections of the head & neck come well up to the standard of the extremities. Is it a question of muscles being easier to dissect than arteries, arteries than veins, veins than nerves, &c.? No. The dissector who has just had a leg given him, does he not usually dissect with great minuteness the small upper branches of the femoral artery and internal saphenous vein, the lymphatics & glands, and even do his best to find the crural branch of the genito-crural nerve—while he often neglects, later on, the larger branches of the same trunks and of the profunda? Is it that

he specially cares for the “parts concerned in inguinal & femoral herniæ”? No; it is exceptional for these to be got out at all satisfactorily.

It is submitted that it is the *more or less complex felting of the structures* that constitutes the difference between the several parts of the body from the dissector’s point of view.

Towards the middle and greater part of the limbs, the structures run more or less parallel to each other, there is no felting to speak of, and the dissection is relatively easy. We have much the same thing towards the middle of the anterior triangle of the neck, where, however, the leading structures (principal arteries & veins) may more appropriately be said to radiate somewhat from a centre.

But the arrangement is essentially different towards the root of the limbs (axilla, Scarpa’s triangle, gluteal region); towards the extremities (palm of the hand, sole of the foot, dorsum of the foot); towards the upper part of the anterior triangle (parotid region); and towards the lower part (root of the neck). Here complex felting prevails; and here it is that the dissection is less easy, or, rather, *more impeded*.

Why is it that “parts” nicely begun, and promising well at first, are, after many delays, so often left unfinished? Is it simply that the dissector tires of his work? There is a deeper reason than that. It is a question of felting. There is necessarily no felting in the superficial structures, even where there is in the deeper ones, and these are consequently always easy to clean. It is the deeper structures which, in certain regions, are felted. Here it is that the untrained dissector breaks down.

Can dissecting be made easy? and how?

Some will say to the dissector, Cut away the superficial structures when you have seen them, and thus make the deep ones superficial.

The plan is sanctioned by custom.

I rebel against it, nevertheless.

It deprives the student of what should be pre-eminently his own—the accumulated products of his past labour. It is now lawful to keep “parts” from one end of the session to the other (six months); they should be kept the full time, undamaged, and be studied over and over again. I never sanction the division of any muscle in the upper limb, except the pectorales major & minor, and sometimes the deltoid; and I require that the outer head of the flexor sublimis digitorum be left undetached. In the lower limb, I only allow the division of the glutei maximus & medius, gastrocnemius, & soleus; and I preserve the arch of the latter. Nevertheless, we dissect down to the bones & ligaments.

The plan of removing the superficial structures takes away the dissector’s interest in his “part.” The intellectual interest to be taken in dissecting lies in so planning the superficial work as to get at the deeper structures to advantage. To be a good dissector, one must be somewhat of a strategist. Practical anatomy is a question of unravelling the feltwork of the human body. The feltwork must not be cut. It is he who understands the mesh, who will dissect both well and quickly. Dissecting should be a fascinating pursuit.

II.

“*De fil en aiguille*”—“From thread to needle”—is a French proverbial expression descriptive of a good way to avoid losing small objects, and to easily find them again when they get out of sight. “Keep a thread in the eye of your needle;” and, if you lose sight of the needle, the thread, which you may rely upon seeing, will at any time lead you up to it.

I was working at anatomy in Paris some thirty years ago. “Subjects” were abundant, and we used to get out the same parts over and over again. It struck me one day, when dissecting the pterygo-maxillary region, that an unnecessary amount of labour was spent on each occasion by the method then, and, except with us, still at present in vogue, of getting out the facial nerve and its branches as they traverse the parotid gland. Not feeling satisfied to proceed without each time cleaning the facial nerve, nor caring to be so long over this preliminary part of the work, I set about looking for a quicker way. I found that I could cut down upon the trunk of the facial nerve without much difficulty where it crosses the root of the styloid process, a little above and in front of the transverse process of the atlas, and that, when once on the trunk of the nerve, I could trace out the branches to the face & neck in a very short time. It is in this way that I have dissected the facial nerve ever since, and many are the anatomists that I have surprised by the rapidity and completeness of detail with which I conduct the dissection. Here the transverse process of the atlas leads me to the styloid process, the styloid process leads me to the trunk of the facial nerve, and the trunk leads me to the branches.—“*De fil en aiguille*.”

I would direct attention for a moment to the sole of the foot. Have we not all seen, with a kindly pity for him, a poor unfortunate dissector first remove the skin of the sole of the foot as scrupulously as one might remove that over the perinæum or the parts concerned in inguinal or femoral hernia, and then look, in the dense, hard, granular fat, for the plantar cutaneous nerve, and, after failing to find it—as he almost necessarily would—spend some hours more looking, also fruitlessly perhaps, for the digital nerves? How can we best help the deserving fellow? First, we should tell him that the plantar cutaneous nerve should be looked for where it leaves the trunk of the posterior tibial, and then be traced down to the sole of the foot. Then we should show him the way of finding the digital nerves by cutting straight down upon the plantar fascia and exposing the slips to the toes. This is done by first cutting down upon the back part of the under surface of the os calcis, to which the fascia is attached, and which marks the level at which the fascia is found. The dissector can now, in a few minutes, clean the whole of the fascia forwards till, in the vicinity of the metatarso-phalangeal articulations, it is seen to split up into the above-mentioned slips to toes. Between these slips, and corresponding to the intervals between the toes, the fat suddenly changes character. From being dense, hard, and granular, it suddenly becomes quite soft; and, from being previously bound down by the pressure of the undissected fascia, it comes, as soon as this is removed, to project in, so to speak, four soft pads or cushions. It is beneath these latter that the dividing trunks of the digital nerves are found, which, with the digital arteries, which are a little deeper, can now be traced to the toes without hindrance. Here the os calcis has led to the plantar fascia, which, if it had been attempted to cut down upon

it directly, would probably have been cut through, to the injury of the deeper structures. The undivided part of the fascia has led to the slips to the toes; these have led to the four soft pads or cushions, which, in their turn, have led to the digital nerves and arteries.—“*De fil en aiguille.*”

Again, let us glance briefly at the popliteal space. What a crowd of superficial structures stand here in the way of the deeper ones! Small sciatic nerve and external or short saphenous vein, with the two branches of origin of the external saphenous nerve; then, beneath the fascia, the sural arteries & veins, and the nerves to the heads of the gastrocnemius & plantaris; how they impede the dissection of trunk artery, vein, & nerves! Can we wonder at the dissector missing the articular arteries? Is there a way of rendering the dissection, at least relatively, easy?

Dissect wide of the popliteal space itself, clean and lift up the inner head of the gastrocnemius on the one hand, and the outer head on the other. Beneath them you will find the inferior internal articular artery running downwards & inwards upon the tibia, and the inferior external articular passing horizontally outwards above the head of the fibula. Deal similarly with the muscles bounding the space superiorly, the biceps on the one hand, the semi-tendinosus & -membranosus on the other; and the superior internal & superior external articular arteries, if they are not seen at once, can at least be felt upon the femur in the midst of the bed of fat in which they lie. Then, from beneath the raised muscles, the trunk artery, vein, & nerves can be reached, and thoroughly cleared and isolated with the finger. The dissection of the space is now half completed. Here again, “*de fil en aiguille.*”

Examples could be multiplied almost *ad infinitum*.

The “*De fil en aiguille*” principle is the best guide to the dissector when looking for the smaller structures.

It is the best guide for the demonstrator when helping the student out of his difficulties with his “part.”

I have always noticed that there are certain stages in the dissection of almost every part of the body, at which the average dissector is stopped by difficulties which he is unable to overcome, unless a little help be given him.

The deep dissection of Scarpa’s triangle is a case in point. The dissector has got out fairly, we will say, femoral artery & vein and anterior crural nerve, with the beginnings, but little more than the beginnings, of their principal branches. But now he is uncertain how to proceed. He does not know how to follow out the branches. He tries one, and finds he cannot get on far with it because there is something in the way. He tries another, with the same result. After doing his best for a time, he gives up the effort, and leaves the part unfinished. I am sure that everyone who has spent, if only a few weeks, in a dissecting room, will be familiar with the case here depicted. To give this dissector a fresh start, all that I have usually found necessary is to show him that he must first thoroughly free and lift up the branches of the anterior crural nerve in order to get fairly at the external circumflex artery; and that he must then separate the adductor muscles, so as to get upon the profunda artery with its internal circumflex & perforating branches, and upon the obturator nerve & vessels.

The dissection of the upper part of the anterior triangle of the neck (parotid region) is another similar instance. Where the carotid artery and its later branches dip into the parotid gland, the student finds the deeper dissection hampered by the great auricular nerve & external jugular vein, which, with us at least, he is taught to preserve ; by Steno's duct—to him a something *sui generis* which he has a difficulty in identifying ; and by the branches of the facial nerve, so beautifully, but so perplexingly, depicted in plates. Here again, after spending much time in vain efforts, the student once more finds himself stopped in his work. It suffices, I have always found, to put him on the trunk of the facial nerve, as already explained, showing him how its radiating branches *cross* the trunk of the carotid and its later branches, so that he can trace out the nerves in the parotid gland without injuring the arteries, to start the dissector once more “on his way rejoicing.”

III.

Every art has its more or less precise rules, which, if excellence is to be attained, must be carefully applied from the very first. We would lay down four cardinal rules for the dissector :—

1. *The dissector should most carefully study his part, BEFORE BEGINNING TO DISSECT IT.* He should study it on plates ; he should study it in the museums he has access to,—on the model dissections always left out for study in our anatomical school ; he should study it on the dissections of others. The contrast cannot be too sharply accentuated between the dissector who earnestly studies his part first and dissects it afterwards, and he who dissects it first and reads about it

afterwards. The former, while he is dissecting, knows what he is to look for; where things are, what they look like, how they run; where he is on safe ground and can cut freely, where he may do damage and must be cautious. He is planning his operations so as to make the most of his opportunity. He is doing work both enjoyable and of the highest possible order. The best descriptions are but imperfect embodiments of scientific truth: our worthy friend is critically examining and checking such as his teachers have placed before him, and he is laying the foundation of that individual acquaintance with things which lies at the base of all true knowledge. The other dissector, on the contrary, is blindly bungling through his work, laboriously cleaning, perhaps, a muscular artery because it chances to be large, and removing a ganglion with its roots because, being small, it fails to catch his untrained eye. When he sets to read, he finds that many things of interest have been cut away from his part, and that he has himself greatly restricted his opportunity of learning.

2. A point to which the dissector should pay great attention from the very first refers to the cleaning of all arteries, veins, and nerves. These "long organs" (as, in fact, all the organs of the body) lie in a sheath of connective tissue, which is but *slightly adherent* to them. Why this is, will be easily understood. It is a general rule that, wherever there is pressure or friction, there the cellular tissue becomes laminated and free from fat—*i.e.*, aponeurotic or semi-aponeurotic. It is this condensed layer (more or less condensed according to circumstances) that constitutes the sheath of either artery, vein, or nerve. Let the dissector get his knife *within* the

sheath, and he will find that it *will easily peel off*. By getting, and keeping within the sheath, the dissector will clean things efficiently, neatly, and quickly. The only necessary precaution is to keep the knife from the side of the "long organ," from which any important branch is known to be given off.

Much the same thing may be said of muscles. We do not generally speak of the sheath of a muscle. A muscle is surrounded, nevertheless, by a closely fitting covering of connective tissue, or fascia. If the dissector knows how to set about his work, he can peel this covering off with the greatest ease,* thoroughly baring the contractile fibres. No more important advice can be given to the dissector than that of thoroughly cleaning all muscles as soon as they present in the course of dissection. All muscles should be cleaned from origin to insertion, and not in front only, but all round, except, of course, where their nerve, or a large artery, enters their substance. Nothing can do more to further good dissections than the habit of cleaning all muscles early and well. Nothing can hamper the dissector more than the neglect of this part of his work. This leads us on to 3.

3. When an artery, vein, or nerve is to be sought in an intermuscular space, this space should first be *opened up as widely as possible, by dissecting close to, and carefully cleaning, the muscles themselves*. This preliminary part of the work will bring the dissector upon the "long organs" which it is desired to trace out *to the greatest advantage*. Opportunities for the useful application of this rule are to be found everywhere. It is a rule of the *very widest application*.

Where an intermuscular space can be opened both from the front and from the back, it is well to delay completing the dissection till the space can be so opened: *e.g.*, dissection of the dorsalis scapulæ artery and circumflex vessels & nerve in the triangular & quadrilateral spaces at the back of the shoulder; of the anterior tibial artery as it pierces the upper part, and of the anterior peroneal artery as it pierces the lower part, of the interosseous membrane of the leg; of the radial artery as it passes from the dorsum to the palm of the hand, first between the two heads of the first dorsal interosseous muscle or

* Except as regards the cutaneous surface of a very few muscles, such as deltoid, gluteus maximus, upper part of the trapezius, the first layer of muscles of the sole of the foot.

abductor indicis, and then between the adductor pollicis and the inner head of the flexor brevis.*

4. *All superficial structures* should be thoroughly cleaned from end to end, so as to be *got well out of the way* (not necessarily removed) before the deeper ones are taken. The dissector should dissect in broad even planes, or strata. The dissection should not be deepened over any small area, and left superficial all round. This rule should be more particularly observed in such parts as Scarpa's triangle, the triangles of the neck, the popliteal space, the bend of the elbow.

* A step further is open, in a few cases, to the thoughtful dissector. Thus, previous to dissecting the pterygo-maxillary region, the inferior maxillary nerve may be traced from within the cranium through the foramen ovale, and a probe passed through the foramen by the side of the nerve, the search for which will then be greatly facilitated in the later dissection. Similar cases present in the dissection of Meckel's & the otic ganglia.

In connection with Rule 3, the bringing together of a few general remarks on the cleaning of the vasculo-nervous bundles, which would lose by being scattered, may not be out of place. Each element of a vasculo-nervous bundle should be separated from its fellows and cleaned all round. In complicated bundles, such as those found in the axilla, the popliteal space, the triangles of the neck, this is by no means an easy matter. But it will pay the dissector to take some trouble here; by so doing he will often see important structures and relations, which would otherwise be passed unnoticed. In cleaning a vasculo-nervous bundle, the dissector should endeavour to get his finger beneath the bundle, the part being flexed, if possible, so as to relax the bundle, which should then be well cleared posteriorly, and lifted up as a whole. It is surprising what help this affords. The more accessible elements should now be cleaned, and then drawn out of the way, so that the others may be got at in their turn. The sheath of the large nerve-trunks, such as the cords of the brachial plexus, whether in the posterior triangle of the neck or in the axilla, is extremely dense and laminated, and must be peeled off in successive strata before the trunk is really bared; the arrangements of the plexus cannot otherwise be made out.

IV.

It cannot be too strongly impressed upon the dissector that a dissection should be worked at steadily every day till it is completed. A dissection once completed, and of which all the structures are well cleaned, will keep nice for months. Not so with a part which is left unfinished. This spoils more rapidly than the inexperienced would easily believe, and it can never be made attractive.

All structures that are *nearly bared* should be cleaned thoroughly before work is left off for the day. While a thick layer of fat or fascia left over a structure will preserve it for a time from drying, and keep it fresh, a thin layer, especially of laminated cellular tissue not containing much fat, will, on the contrary, dry up with the structure, and become so thoroughly incorporated with it, that it can never properly be removed. Even the plan of moistening the part will not help much in the case of small structures which have once been allowed to dry; besides which, wetting a part washes out the colour of the muscles, and first whitens and then darkens the connective tissues, so that distinctions of structure previously quite plain are effaced, and the work rendered much more difficult and uncertain. Parts should be dissected while fresh, if good work is to be done. Dissection is twice as easy then as it is later on.

Brief and unexplained references will be noticed here and there to "clamps," "hooks reflected over blocks," "callipers," &c. It seemed difficult, in a book intended primarily for the guidance of dissectors at the School of Anatomy, &c., to avoid all mention of appliances in constant use in the Author's dissecting-room; neither did it seem worthy of the general subject dealt with to refer more fully to small mechanical devices, however useful in their way.

I.

HEAD AND NECK.



TRIANGLES OF THE NECK.

It is customary to take the triangles of the neck separately, the posterior triangle being usually dissected before the anterior one. This is of advantage to one who dissects the head and neck for the first time, and who necessarily dissects somewhat slowly; and the plan has been adhered to in the main text: the structures (especially the infra-hyoid muscles) will not require the same care to prevent them from drying before the dissection is completed. But it must be understood that, for the practised dissector, there is much saving of time in cleaning the two triangles together. The sterno-mastoid being well lifted up from origin to insertion, as explained in the foot-note on page 25, it is easy to see that the dissector will gain considerably in cleaning connectedly the *whole* of the omo-hyoid together with the other infra-hyoid muscles; in tracing the transversalis humeri and the transversalis colli arteries simultaneously from their common trunk; in taking in conjunction the internal jugular & subclavian veins; in following out the whole of the spinal accessory nerve at one time; &c.

I.

POSTERIOR TRIANGLE.

The dissection may be divided into three stages, and is greatly facilitated by these being well distinguished one from the other.

First stage.—*The value of the dissection, when completed, will depend to a great extent on the amount of care bestowed upon this first stage.* Clean *whole* of platysma. This is important; otherwise it will be difficult to find the several structures beneath it.

The safest and most expeditious way of exposing the platysma is by an oblique incision along a line extending from about the middle of the lower jaw to the middle of the clavicle. One thus comes upon the thickest & most highly coloured part of the muscle, and the danger is least of cutting through it without noticing it. The plane of the muscle being reached, the usual transverse incisions along the clavicle and lower jaw may be made with safety, or, better still, these incisions may be made from within outwards as the skin is dissected up.

Find, beneath the platysma, the *external jugular vein*, and the *superficial cervical* and *great auricular* nerves; also the *small occipital* nerve, which latter lies much farther back than is generally supposed.

The external jugular vein should be made out first, as it crosses the superficial cervical nerve, and is therefore a guide to the latter (see also note, p. 26). If not immediately visible through the fibres of the platysma, blood may often be driven up into it by pressing the finger upwards & inwards from the middle of the clavicle. The great auricular nerve will generally be found without difficulty where it passes up on the sterno-mastoid towards the lobule of the ear.

The fascia over the upper part of the sterno-mastoid is extremely dense, and opposes a considerable obstacle to the search for the small occipital nerve beneath the skin. The nerve may, however, be found at its origin beneath the sterno-mastoid and underneath the spinal accessory nerve. It arises in common with the great auricular & superficial cervical nerves (a fact not generally stated), and, above these, from the first cervical nerve. As the origin of the small occipital lies beneath the spinal accessory nerve, this latter nerve should be found first and lifted up; otherwise it may easily be divided. As soon as the small occipital nerve is found at its origin, it can of course be traced without difficulty to the back of the head.

With a view to retaining them in position in the later stages of the dissection, the *external jugular vein* and the *great auricular nerve* should be *left adherent by a strip of fascia to the front of the external ear*.

Make out the superficial descending branches of cervical plexus,* and the *spinal accessory nerve*.

The anterior edge of the trapezius should now be carefully cleaned along its whole length, both on its upper & under

* If the dissector is more than usually painstaking, there is a possibility, while he is tracing up the superficial cervical and phrenic nerves to their origins, of his dividing the origins of the communicans noni. This is less likely to happen if the sterno-mastoid is well lifted up or reflected, and the two triangles are dissected together. It will be noticed, as stated in a note further on, that the common origin of the above nerves may be taken advantage of for finding the *ansa hypoglossi*, should it otherwise not easily be made out.

surfaces. This is an essential preparation for the second stage of the dissection.

Second stage.—Trace out the transversalis colli & supra-scapular arteries, *removing the corresponding veins*; clean the phrenic nerve in front of the scalenus anticus. These and the following structures lie in a considerable amount of loose adipose tissue, in the midst of which the arteries should first be felt for with the finger; the supra-scapular artery runs deeply behind the clavicle.*

* It may be here the right place to remark that it is essential to anything like a good dissection of the triangles of the neck that, sooner or later, the *sterno-mastoid* muscle be *thoroughly separated from all subjacent structures* from sternum and clavicle, below, to mastoid process & superior curved line of occipital, above, and *cleaned on its under surface*. In the large print it is contemplated that this dissecting up of the sterno-mastoid and cleaning of its under surface shall be done piecemeal as those parts of the several structures are got out, which run underneath it in a portion of their course.

If the dissector is well up to his work, it will be good policy for him to consider this dissecting up of the sterno-mastoid and cleaning of its under surface as a kind of *preliminary operation*, and to undertake the same at a much earlier period than is above indicated—as soon, in fact, as he has made sure of the spinal accessory nerve in the posterior triangle of the neck. The deep structures of the neck lie in very loose and soft connective tissue, and it is surprising to the inexperienced with what ease they can be turned out of their bed, when once they are thoroughly got at by the above preliminary dissection of the sterno-mastoid. Even more than this can be done. The sternal & clavicular origins of the sterno-mastoid can be detached, with the corresponding bone, with a Hey's saw and chisel, and the muscle temporarily reflected; when the dissection is completed, the muscle to be replaced, and its bony origins wired down.

In dissecting up the anterior border of the sterno-mastoid, the dissector will of course be careful, towards the upper part of the muscle, of the deep portion of the spinal accessory nerve. If this nerve be not seen at once, it may be looked for as it crosses the prominent transverse process of the atlas, and emerges from beneath the occipital artery and the posterior belly of the digastric & stylo-hyoid muscles. Towards the middle of the sterno-mastoid, the dissector will be careful of the sterno-mastoid or superficial descending branch of the superior thyroid artery, which should be divided, however, after it has been seen, as it stands much in the way of the deeper dissection.

Third stage.—Clean the subclavian artery and vein, and the cords of the brachial plexus.

II.

ANTERIOR TRIANGLE.

Read note on previous page referring to dissection of sterno-mastoid, and clean the muscle from top to bottom, as indicated. The superficial cervical nerve will have to be divided near the middle line, and reflected;* the other superficial nerves and the external jugular vein should be left *in situ*.

As soon as the sterno-mastoid has been dissected up, the first structures to be looked for beneath it will be the descendens and communicans hypoglossi nerves (*ansa hypoglossi*), with their branches to the infra-hyoid muscles.

The *ansa hypoglossi* should first be looked for as it crosses the common carotid artery & internal jugular vein towards the lower third of the neck. Cleaning first the sterno-hyoid & -thyroid muscles, and then the omo-hyoid *from inner to outer border*, and then tensing these muscles by drawing them downwards and inwards, not unfrequently tenses also the two nerves, thus bringing them into evidence. Should they not be seen, however, the structures should not be disturbed, as this might lead to the cutting of the nerves sought for, but either one or other of the following means of finding them should be adopted:—

(*a.*) The descendens hypoglossi nerve should be looked for in either of the following situations, namely: (1) as it emerges, opposite the crico-thyroid membrane, from beneath the internal jugular vein or its superior thyroid branch; (2) as it arises, high up in the neck, from the posterior aspect of the hypoglossal nerve. Or else,

(*b.*) The origin of the communicans noni nerve from the second and third cervical nerves should be sought for by tracing up some of the superficial

*The circumstance that the superficial cervical nerve must be divided near the middle line of the neck may, if there is a difficulty in finding the nerve—as in a fat subject, or when the external jugular vein has been missed—warrant its being looked for by dissecting up the platysma as a whole from the middle line outwards: the superficial cervical nerve is always quite apparent on the *under* surface of the muscular plane.

cervical nerves, or the phrenic nerve, to the common origin. When once either nerve is found, no difficulty will be experienced in completing the dissection of the entire loop.

The next thing to do is to clean the infra-hyoid muscles; otherwise these thin muscles will dry, and no longer be separable from one another.*

The next thing is to carefully clean the stylo-hyoid and posterior belly of the digastric, and to lift them up from origin to insertion.

Beneath these muscles pass the large arterial & venous trunks of the anterior triangle, the branches of the external carotid (except the superior thyroid), and the ninth, tenth, eleventh, and twelfth nerves; and, as with the sterno-mastoid, the cleaning and lifting up of these muscles affords the most material assistance in the cleaning of the structures beneath them. These structures are exceedingly numerous and delicate. None but a skilled dissector should attempt to get them out without having before him, if possible, a dissected part, or at least a good plate, and without having carefully studied the same.

* It is not generally recommended that these muscles be dissected at this early stage; but nowhere, perhaps, is delay so damaging to the prospects of the dissection, or so wasteful of the student's time & energies, as in the parts about here. The remark applies more particularly to the infra-hyoid muscles, the ansa hypoglossi, the crico-thyroid branch of the superior thyroid artery, the external branch of the superior laryngeal nerve, and the thyroid gland. These parts, early exposed by the removal of the platysma, and lying, as they do, quite superficially, when the sterno-mastoid is retracted, and in very loose cellular tissue, laminated, and without fat, strike one, particularly on the second or third morning of the dissection of the head & neck, by their brilliant and full-toned hues. They can then be turned out with more than usual ease. But, if the dissection is delayed, as, for some unaccountable reason, it usually is, they soon dry up into an indistinct mass of faded and hardened muscle and blackened cellular tissue, in which not only are the artery & nerves above named undiscoverable, but the muscles themselves are adherent to the subjacent thyroid gland. Few dissectors, it is believed, get a good view of the thyroid gland & its surroundings, important as the parts are in connection with tracheotomy, through leaving this part of the dissection to too late a period. Below the thyroid gland, beneath the infra-hyoid muscles, and in front of the trachea, is a considerable mass of loose fatty tissue, which should also be removed early, with a view to exposing the inferior thyroid veins.

In cleaning these structures all the *venæ comites* should be removed,—the internal jugular vein, and the external jugular, already met with, being of course preserved. The *venæ comites* pass in front of the corresponding arterial trunks.

The structures requiring most care are the ascending pharyngeal artery, the branch of the hypoglossal nerve to the thyro-hyoid muscle, and the external branch of the superior laryngeal nerve.

The ascending pharyngeal artery arises in the angle of separation between the internal and external carotids, and passes up, in front of, and internal to, the former.

The nerve to the thyro-hyoid arises from the lower border of the hypoglossal as the latter crosses the facial artery just below the posterior belly of the digastric and stylo-hyoid.

The external laryngeal branch of the superior laryngeal nerve is best looked for as it gets beneath the upper part of the sterno-thyroid muscle. It runs just behind the oblique line on the ala of the thyroid cartilage on the surface of the inferior constrictor of the pharynx, and thus reaches the crico-thyroid muscle. It can now be traced upwards to the main trunk, which it joins much higher up than is figured in Hirschfeldt's plates.

The dissection is generally very much neglected both at the lower part and at the upper part of the anterior triangle of the neck.

LOWER PART OF ANTERIOR TRIANGLE.

The structures in the lower part of the anterior triangle (phrenic nerve, inferior thyroid artery & inferior or recurrent laryngeal nerve, middle cervical ganglion of the sympathetic, vertebral artery) should be taken in conjunction with the dissection of the thorax,—the latter cavity being widely opened in front, as in our way of presenting it. It will be a great help if the origins of the sterno-mastoid are chiselled off, and the muscle reflected as explained in note on page 25.

Find in the upper part of the thorax the phrenic & pneumogastric nerves, and the innominate vein, and remove the soft adipose tissue in front of these and the trachea, detaching these structures from the sternum & clavicle. (This must be done without damaging the origins of the sterno-hyoid & -thyroid muscles) It will then be easy to trace the two nerves into the thorax, and to follow the internal jugular & subclavian veins into the corresponding innominate trunk.

This is the time to clean the subclavian vein, which is never easy to get at in the dissection of the posterior triangle of the neck.

Trace the inferior or recurrent laryngeal nerve below and then behind the subclavian artery on the right side, and the arch of the aorta on the left ; and follow it up in the groove between the trachea & œsophagus. Here the nerve lies behind the inferior thyroid artery.

Trace the cord of the sympathetic. It lies behind the common carotid artery, and crosses the inferior thyroid artery anteriorly, presenting its middle cervical ganglion in about this situation.

The inferior thyroid artery can now be traced from the

thyroid axis. It takes a tortuous course upwards & inwards behind the vasculo-nervous bundle of the neck. Trace out its ascending cervical branch.

The removal of a little cellular tissue will now expose the vertebral artery as it passes up between the scalenus anticus & longus colli, and enters the foramen in the transverse process of the sixth cervical vertebra.

The internal mammary & superior intercostal arteries, and inferior cervical ganglion of the sympathetic, and the relations of the first part of the subclavian artery—structures which properly belong to the thorax—can easily be made out at the same time as the above.

UPPER PART OF THE ANTERIOR TRIANGLE.

The trunk of the facial nerve being found as already explained (see p. 12),* its temporo- and cervico-facial branches should be traced through the parotid, and the anastomoses made out between the former & the auriculo-temporal, and between the latter and the great auricular.

The external carotid, with its posterior auricular & temporal branches, and the commencement of the internal maxillary can now be cleaned.

To find the auriculo-temporal nerve, dissect close to the posterior border and under surface of the neck of the condyle. The nerve will then be seen as a large trunk (about the size of

* For another way of finding the trunk of the facial nerve, see Addendum. p. 118.

the facial), looping backwards and upwards towards, and then beneath, the temporal artery.

This being done, the whole of the parotid gland should be removed,—Steno's duct being reflected upon the face, and the great auricular nerve & external jugular vein being left adherent by a strip of fascia to the front of the external ear.

The removal of the parotid gland will expose the deep structures down to the vertebræ & the wall of the pharynx,—these including the stylo-glossus & -pharyngeus muscles and the glosso-pharyngeal nerve, and, beneath these, the several elements of the deep vasculo-nervous bundle of the neck. Of these latter, the one that requires most care is the *superior laryngeal nerve*. Arising from the pneumo-gastric very high up (from the ganglion of the trunk), it crosses behind all the other structures of the vasculo-nervous bundle, and while these are being cleaned, it is constantly exposed to be divided.

The division of the stylo-maxillary ligament will greatly facilitate the cleaning of these deep structures. This ligament being divided, the angle of the jaw can be forcibly lifted up, when a considerable mass of fat will be found beneath it on the inner surface of the internal pterygoid. This can safely be removed down to the wall of the pharynx, when the vasculo-nervous bundle can be got at from the front as well as from the outer side.

The superficial portion of the submaxillary gland being well turned down, and a little fat removed from the under surface of the mylo-hyoid, the submental artery and the mylo-hyoid branch of the inferior dental nerve will be seen on the under surface of the mylo-hyoid muscle, the latter close to the lower jaw. The former is prolonged beneath the anterior belly of the digastric.

III.

MUSCLES OF THE FACE.

If a good view of the muscles of the face is to be obtained, these should be dissected at the very earliest opportunity, before their colour has faded away. This practically involves, however, the sacrifice of the facial nerve, unless the additional labour be accepted of seeking its principal branches separately, instead of dissecting them from the parent trunk. There is, of course, no difficulty in dissecting the facial artery and its branches at the same time as the muscles.

As these muscles are usually very much neglected on account of their dissection being considered difficult, one hardly likes to press the work of cleaning them, especially with the above-mentioned additional difficulty, upon the dissector, who is just beginning the head & neck, and whose hand is supposed to be still untrained to the more minute kind of anatomical work. The reference to the muscles of the face is therefore placed here, at the earliest opportunity *after* the dissection of the facial nerve by the method recommended in the dissection guides.

From the dissector's point of view, the four following strata of muscles of the face may be recognised with advantage :—

(1.) Orbicularis palpebrarum, anterior belly of the occipito-frontalis, pyramidalis nasi;

(2.) Levator labii superioris alaeque nasi, levator proprius labii superioris, zygomaticus minor, zygomaticus major, risorius, depressor anguli oris:

(3.) Compressor nasi, levator anguli oris, buccinator, depressor labii inferioris;

(4.) Corrugator supercilii, tensor tarsi, depressor alae nasi, levator labii inferioris.

The mouth and eyelids to be well and evenly distended with tow or cotton wool; the lips and free margin of the eyelids to be stitched together.

In the above list we have first the orbicularis palpebrarum, with the anterior belly of the occipito-frontalis and the pyramidalis nasi. This latter small muscle is generally a well-defined fascicle, highly coloured, and easily found on either side of the

middle line of the bridge of the nose. It may be got out first, as it will lead conveniently both to the anterior belly of the occipito-frontalis and to the orbicularis. While exposing it, tense it by drawing up the skin of the forehead in the middle line.

While cleaning the anterior belly of the occipito-frontalis, draw the whole width of the scalp backwards.

Just to the outer side of the pyramidalis are the innermost fibres of the orbicularis, which are nearly parallel to it, and easily made out, moreover, by their arising from the tendo oculi and from the adjoining part of the internal angular process of the frontal bone & nasal process of the superior maxilla.

Where the anterior belly of the occipito-frontalis is inserted into the orbicularis, carefully define the edge of the latter.

Now clean the lower and inner part of the orbicularis. Here its fibres are first nearly parallel to, and then diverge slowly from, the fibres of the levator labii superioris alæque nasi, which is internal to it, and can thus easily be defined. More externally, the circumference of the muscle is free, and merely overlaps the levator proprius labii superioris, and sometimes the zygomatici, a distinct cellular interval intervening. This portion of the orbicularis should be well lifted up from off the subjacent muscles.

Now take in the main the second stratum of muscles.

Clean the levator labii superioris alæque nasi.

From beneath its inner edge will be seen to emerge the pale fibres of the compressor nasi.

Its outer edge is contiguous inferiorly with the levator proprius labii superioris.

There may now be taken in succession the levator proprius labii superioris, the zygomaticus minor, the zygomaticus major, the risorius, and the depressor anguli oris or triangularis oris. These muscles, with which may be associated the foregoing levator labii superioris alæque nasi, form a radiating plane of fibres, continuous at its insertion into the orbicularis oris, interrupted peripherally.

It will be noticed that the levator anguli oris and the buccinator have been left out from the place they are usually made to occupy in the enumeration of the muscles of the face. The reason is that, as shown in the above list, they belong to a deeper plane than the foregoing, as do also the depressor labii inferioris or quadratus menti, and the already-mentioned compressor nasi.

The more superficial plane being well made out, and its several fascicles cleaned and lifted up, it will be easy, through

the intervals between the radii they represent, to make out the deeper muscles.

The levator anguli oris arises from the upper jaw below the opening of the infra-orbital foramen, and is therefore crossed by the infra-orbital vessels & nerves.

The buccinator will, of course, be made out without difficulty, and will be seen to dip externally beneath the masseter, a little in front of which it is perforated by Steno's duct.

The depressor labii inferioris is closely adherent to the skin, and is distinguished from the depressor anguli oris, from beneath which it emerges, mainly by the direction of its fibres, which pass upwards and inwards, while those of the more superficial muscle pass upwards and outwards.

The above muscles being made out, there come finally the corrugator supercilii, the tensor tarsi, the depressor alæ nasi, and depressor labii inferioris.

By dividing some of the inner fibres of the anterior belly of the occipito-frontalis, and turning up the upper & inner portion of the orbicularis, the corrugator supercilii will be seen arising from the inner extremity of the superciliary ridge, and passing outwards to be inserted into the under surface of the orbicularis.

The tensor tarsi must be sought for after the deep dissection

of the orbit has been completed. Sever the palpebral ligament, and turn the eyelids over upon the nose. The muscle, with its two slips going, the one to the upper lid, the other to lower lid, will be seen on the posterior aspect of the reflected portion of the tendo oculi.

By turning up the upper lip, drawing up the nose, and dividing the mucous membrane near the frænum, a small fasciculus will be seen near the middle line ; this is the depressor alæ nasi.

Internally to the inner fibres of the depressor labii inferioris is the small bundle of fibres of the levator menti.

Though lying in very dense cellular tissue, the posterior belly of the occipito-frontalis will easily be made out after the dissection of the back of the neck. It arises from the outer two-thirds of the superior curved line of the occipital bone, and from the mastoid portion of the temporal.

The retrahens aurem is a small fasciculus arising from the mastoid process, and easily made tense by drawing the ear forwards. The attrahens and attollens aurem are quite superficial, but very faintly marked.

IV.

PTERYGO-MAXILLARY REGION.

This dissection should not be undertaken till the triangles of the neck have been cleaned—especially the upper part of the anterior triangle—this including the facial and auriculo-temporal nerves, and the other structures in and beneath the parotid gland, down to the wall of the pharynx & vertebræ. (See upper part of Anterior Triangle of Neck.)

The cleaning of the inferior maxillary nerve outside the cranium is facilitated by the previous cleaning of the same inside the cranium, as it is leaving the cranium through the foramen ovale. A probe passed through the foramen ovale by the side of the nerve is an additional help of no mean value.

This is one of the most difficult parts to dissect, and one requiring much care. The difficulty of the dissection is threefold:—(1.) No less than four preliminary operations, each involving danger to some structure or other, have to be undertaken before all the branches of the internal maxillary artery and inferior maxillary nerve can be got at. (2.) Some of the branches of the artery, and most of the branches of the nerve, have to be traced, not from the corresponding trunk, but, at least to some extent, towards it. (3.) The relatively superficial structures stand in many places in the way of cleaning the deeper ones.

Preliminary operations above alluded to:—

1. *The masseter should be cleaned and lifted up, — with care at its upper and back part, where the vessels and nerve enter the muscle, — and the temporal fascia should be removed.* A chain saw should now be introduced beneath the zygoma, and the latter should be sawn through as far forwards, and as far backwards as possible. The masseter should now be turned down, the *masseteric branches of the internal maxillary artery and inferior maxillary nerve* being found as they enter its upper and back part. These should be divided a short distance from the muscle. Before dividing the nerve, however, it is

well to trace it up as far as possible, as it will probably lead to the posterior deep temporal, which usually arises in common with it.

2. *The coronoid process must be sawn off, and the temporal muscle turned up.* It is well to lift up and clean the under surface of the temporal muscle before sawing off the coronoid process. In this way the *buccal nerve* and artery will probably be seen just beneath, and in front of, the anterior border of the muscle; the nerve should lead up to the *anterior deep temporal nerve*, as the two nerves generally arise by a common trunk,—from which latter, as a rule, there also arises the nerve to the external pterygoid. While turning up the temporal muscle, the deep temporal branches of the internal maxillary artery and inferior maxillary nerve should be traced out.

3. *The neck of the condyle must be sawn through, and so must also the ramus of the jaw at a point just above the entrance of the inferior dental vessels and nerve into their bony canal.* Before sawing the bone, the jaw should be lifted up, and the structures beneath it should be identified & protected from the saw.

The dissector should now come upon the two first portions of the internal maxillary artery. But, as the artery may lie deeply between the two pterygoid muscles—instead of lying on the surface of the external pterygoid, and between it and the temporal—the fourth and last of the preliminary operations will now be described, after the performance of which, the dissector will be sure to be upon the artery, if he has not met with it before.

4. *The condyle of the jaw must be disarticulated, and thrown forwards with the interarticular fibro-cartilage and the external pterygoid muscle.*

By looking at the base of the skull the dissector will see that behind and internal to the glenoid fossa and condyle, there lie from behind forwards and inwards, the Glaserian fissure, the foramen spinosum, and the foramen ovale, towards or from which pass respectively the tympanic artery & the chorda tympani, the middle meningeal artery, and the inferior maxillary and small petrosal nerves and small meningeal artery. These structures lie, therefore, behind & internal to the capsule of the joint, and the dissector will see the importance of dealing with much care with the latter. It is a tough, fibrous structure, which must be removed piecemeal.

The dissector has now reached the centre of the region.

The internal maxillary artery will lie prominently before him,—either on the surface of the external pterygoid, or beneath it. Its inferior dental branch descends on the surface of the internal pterygoid; and here will be seen, beneath and behind this branch, the inferior dental nerve, and beneath and in front of it, the gustatory. Beneath the two nerves is the internal lateral ligament of the jaw.

The internal maxillary artery may now be cleaned freely, except along its superior aspect, as it is from this aspect that there should arise, from behind forwards, first the tympanic artery, then the middle, and then the small meningeal.

The middle meningeal, by far the largest of the three, may be looked for first, and may be cleaned freely along its outer or superficial aspect; but care is needed in dealing with its posterior and anterior aspects, as from the former there may arise the tympanic artery, and from the latter the small meningeal.

The superficial root of the auriculo-temporal nerve generally crosses the middle meningeal artery close to the base of the skull, while its deep root lies beneath the artery; the nerve then runs horizontally backwards towards the temporal artery, crossing the direction of the tympanic artery, which is superficial to it, and of the internal lateral ligament of the jaw and the chorda tympani, which lie beneath it, the ligament being superficial to the chorda.

The chorda tympani may be looked for beneath the internal lateral ligament of the jaw and the inferior dental nerve, where it will be seen to join obliquely the posterior aspect of the gustatory nerve. In the writer's experience it lies a good deal higher up than is generally represented in plates. It will be seen from the above that the posterior aspect of the gustatory nerve should be cleaned with care.

The dissector has now to get close to the trunk of the inferior maxillary nerve as it leaves the foramen ovale, and to the origin of the two deep temporal, masseteric, pterygoid, and buccal nerves, which arise from its anterior division.

The buccal and anterior deep temporal nerves have been seen to arise, as a rule, from a common trunk. The former nerve, easily found in front of the tendon of the temporal muscle, will probably lead up to the latter; and then the trunk common to these can be traced back through the external pterygoid muscle to the anterior aspect of the inferior maxillary nerve close to the cranium. This common trunk generally gives off the nerve to the external pterygoid, which reaches the inner surface of the muscle.

The masseteric nerve will probably lead up similarly to the posterior deep temporal; then the common trunk of these nerves can be followed up to the outer aspect of the inferior maxillary, also close to the cranium.

There remains the nerve to the internal pterygoid. It is a large branch, which reaches the inner surface of the muscle towards its middle. But the nerves to the pterygoid muscles, especially the nerve to the internal pterygoid, had better be looked for from the inner side in connection with the dissection of the otic ganglion.

V.

SUB-MAXILLARY REGION AND TONGUE.

This region should not be got out till after the triangles of the neck, the face, and the pterygo-maxillary region have been dissected.

Clean the outer surface of the lower jaw in front of the masseter by detaching therefrom the platysma, the depressores anguli oris & labii inferioris, and the mucous membrane of the mouth.

Clean also the inner surface of the lower jaw from the level of the masseter & internal pterygoid to that of the anterior belly of the digastric, carrying the knife close to the bone. This will divide the mucous membrane of the floor of the mouth and the origin of the mylo-hyoid.

If a nice-looking dissection is to be obtained, the mylo-hyoid muscle should be detached from its bony origin with considerable care; otherwise its fibres will separate, and its upper edge will get to look ragged. Scissors are the best instrument to use.

Saw the jaw-bone in front of the masseter & internal pterygoid, and just external to the insertion of the anterior belly of the digastric; and remove, but keep, the detached piece of bone.

The tip of the tongue should now be drawn upwards and forwards while the hyoid bone is drawn downwards. This will tense the hyo-glossus muscle.

Turn down the mylo-hyoid. This will expose the deep portion of the submaxillary gland, the parts on the surface of the hyo-glossus, the genio-hyo-glossus, and the genio-hyoid.

Parts on surface of hyo-glossus from below upwards:—
Hypoglossal nerve; submaxillary gland with Wharton's duct;

lingual or gustatory nerve crossing the duct, and having the submaxillary ganglion hanging down from it by two or three small filaments.

The large posterior part of the submaxillary gland covers the hypoglossal nerve, and the lingual or gustatory nerve with the submaxillary ganglion. As the gland contracts anteriorly, it passes with the duct and the gustatory nerve beneath the sublingual gland. It is in this situation that the gustatory nerve crosses Wharton's duct.

It will be seen that the structures the dissector should clean first are the two glands and the duct. These should be turned upwards and forwards; they should not be completely detached, however, but should be left adherent by a strip of mucous membrane to the floor of the mouth.

The gustatory nerve may be cleaned freely along its upper border, and so may the hypoglossal nerve along its lower border; but along the upper border of the hypoglossal, the anastomotic loop between the two nerves should be looked for, and along the lower border of the gustatory the same loop should be looked for, with, a little behind it, the submaxillary ganglion.

The submaxillary ganglion will generally be found without much difficulty if it is looked for just below the gustatory nerve, beneath the deep portion of the submaxillary gland, and behind the anastomotic loop between the gustatory and the hypoglossal. It hangs down from the gustatory nerve by two or three small nerve filaments.

Parts beneath the hyo-glossus from below upwards:—Stylo-hyoid ligament, lingual artery, glosso-pharyngeal nerve.

The anterior & posterior borders of the hyo-glossus should be clearly defined.

In front of its anterior border will be seen the terminal portion of the lingual artery and nerve, the tendon and the expanding fibres of the genio-hyo-glossus, and the genio-hyoid, to which latter a small twig should be traced from the hypoglossal nerve.

Any structures that may have escaped cleaning behind the hyo-glossus, and on the inner surface of the internal pterygoid, may now be seen to.

The removal of the mucous membrane of the fauces will expose the palato-glossus muscle as it lies in the anterior pillar of the soft palate.

The lingualis inferior will be seen on the under surface of the tongue between the hyo-glossus and the genio-hyo-glossus.

VI.

THE ORBIT, AND CAVERNOUS SINUS.

The orbit should be dissected both from above, and from the outer side.

From above, three dissections should be made—the *superficial dissection*, which should be taken in conjunction with the dissection of the parts in the cavernous sinus; the *middle dissection*; and the *deep dissection*. These dissections will show the structures of the orbit as they are generally seen, and will be the most useful.

The dissection from the outer side supplies, however, a better view of the lenticular ganglion. This dissection should be preceded by a dissection from above, *not taken further than the superficial stage*.

MODE OF OPENING THE ORBIT.

Saw skull-cap close to superciliary ridge.

Find the outer extremity of the sphenoidal fissure by introducing a knife into it with the blade turned *outwards*.

Saw the roof of the orbit from a little internal to the external angular process of the frontal to the outer extremity of sphenoidal fissure; posteriorly, this section should be made with a Hey's saw.

Saw the roof of the orbit from a little external to internal angular process to the middle of the anterior clinoid process, the outer part of this process being removed with the roof of the orbit; posteriorly, this section should be made with Hey's saw. Complete saw-cuts with a sharp chisel. A tap with a hammer on the supra-orbital arch will loosen the piece of bone, which must then be tilted *forwards*.

SUPERFICIAL DISSECTION OF THE ORBIT FROM ABOVE, AND DISSECTION OF THE PARTS IN THE OUTER WALL OF THE CAVERNOUS SINUS.

This dissection, usually considered a particularly difficult

one, is really not so, provided the dissector understands what difficulties it is that he has to contend with.

The difficulties worth mentioning present themselves in connection with (1) the fourth nerve; (2) the lachrymal nerve; (3) the Gasserian ganglion; (4) the "dangerous point," as the author calls it—*i.e.*, the point where the third & ophthalmic nerves approach each other in the outer wall of the cavernous sinus.

1. **FOURTH NERVE.**—From the point where it pierces the dura mater in the free border of the tentorium cerebelli, this nerve may be traced forwards without much difficulty for about a quarter of an inch; but beyond this point it is extremely difficult to follow it *from behind forwards* without breaking it. The least traction is sure to break it. But it is a relatively easy matter to dissect the nerve *backwards from the orbit*. For this purpose, find the nerve on the back part of the upper surface of the superior oblique muscle, and then trace it backwards by carefully dividing the fascia on either side of it and close to it, and finally turning it out of its bed with the flat of the knife. In thus dissecting the nerve backwards it is quite unnecessary to catch hold of it with the forceps.

2. **LACHRYMAL NERVE.**—From the dissector's point of view, this nerve may be divided into an anterior portion, which, though extremely delicate, can be cleaned quite easily on account of its lying in the extremely loose cellular tissue of the orbit, and a posterior portion, which lies in dense fascia beneath the lesser wing of the sphenoid. What the dissector should do in order to get out this posterior part of the nerve,

and thus to show the origin of the nerve from the ophthalmic, is first to dissect the Gasserian ganglion, and then to trace the ophthalmic nerve forwards in the outer wall of the cavernous sinus. Here the ophthalmic nerve lies, it is true, in the dense fibrous tissue of the outer wall of the cavernous sinus, but, as it is a pretty large nerve, it is not very difficult to clean. The trunk and its lachrymal branch being now traced *one towards the other*, the posterior part of the branch, and the point at which it leaves the trunk, will be made out with relative ease.*

3. GASSERIAN GANGLION, WITH WHICH SHOULD BE TAKEN THE INTRA-CRANIAL PORTION OF THE OPHTHALMIC, AND SUPERIOR

* It will be seen that it is a physical difficulty—the same in both cases—which presents itself in the case of the fourth and ophthalmic nerves. When a nerve (or filament of any kind) has to be dissected from out of tissue sufficiently dense to require division with the knife, it must necessarily be tensed in order that it may run in something like a straight line; it would otherwise be exposed to be divided by the incisions intended to free it. The fourth nerve is too slender to bear the traction on its free posterior—*i.e.*, divided—extremity, requisite for it to be dissected from *behind forwards*. But the nerve has a fixed point in front in the muscle which it supplies, and is, therefore, naturally tensed for the purposes of dissection *backwards from the orbit*. Conversely, the anterior portion of the lachrymal nerve comprised within the orbit is too delicate to allow of the tension that would be required for the dissection *from before backwards* of the posterior part of the nerve comprised in the dense outer wall of the cavernous sinus. But this latter part of the nerve has a natural fixed point posteriorly in the trunk of the fifth nerve from which it arises, and may therefore be dissected easily *from behind forwards*.

It seems almost a waste of time to explain such points as these; but difficulties are so much better overcome when they are understood, that the explanation may not be superfluous.

Why the first quarter of an inch of the nerve comprised in the tentorium cerebelli is easily turned out of its bed is due, in the author's mind, to a provision against rupture of the nerve in such slight movements of the cerebral mass as must, though they have never been demonstrated, almost inevitably take place. The nerve is loosely embedded in the first part of its course in the tentorium. Somewhat of the same thing occurs in the case of other nerves as they leave the dura mater, *e.g.*, fifth nerve & lenticular ganglion.

& INFERIOR MAXILLARY NERVES.—The stratum of dura mater is easily removed, which forms the roof of the canal traversed by the fifth nerve; but further on the dissection of the ganglion & the three nerves it gives off is more difficult, on account of the softness of the ganglion and the nerves, and the density of the tissue in which these structures lie.

It will help the dissector to note that the foramen & canal traversed by the fifth nerve are formed by the splitting of the dura mater into two layers, of which one passes above, and the other underneath, the nerve. Further on, over the ganglion and the three primary branches it gives off, these two layers unite,—the *same bundles of fibres*, or the continuation of the same bundles, passing respectively above and underneath ganglion & nerves, so that the ganglion & nerves will be laid bare if the SAME THICKNESS of dura mater be removed from off them as was removed from off the trunk of the fifth nerve.

The dissection of the nerves will further be facilitated by the dissector having a base of the skull before him, and first making out roughly the position of the foramina ovale & rotundum on his “part,” and then feeling for them with a probe.

The inferior maxillary nerve should be thoroughly cleaned as it traverses the foramen ovale, so that, when the pterygo-maxillary region is dissected, a probe may be passed through the foramen ovale, by the side of the nerve, in order that the latter may the more easily be found outside the cranium.

4. “DANGEROUS POINT.”—There is considerable difficulty—though a very different kind of difficulty from that met with in cleaning the fourth & lachrymal nerves—in making out the origin of the nasal branch of the ophthalmic, and its relation to the upper & lower divisions of the third nerve. The third and ophthalmic nerves converge and meet, or nearly meet, in the outer wall of the cavernous sinus at a point just external to the anterior clinoid process. This point is what the author

calls the "dangerous point." Behind this point the ophthalmic nerve was inferior and external, not only to the third nerve, but also to the fourth nerve. Here the ophthalmic nerve gets somewhat above the third nerve, preparatory to two of its branches entering the orbit above the muscles. It is therefore from the *under surface* of the ophthalmic that the nasal nerve is given off. It is with great care, therefore, that the ophthalmic nerve is to be lifted up and cleaned on its *under surface*. It is with great care, also, that the third nerve is to be dissected forwards in the vicinity of the "dangerous point," until the ophthalmic nerve has been made out. Careless cleaning of the third nerve would lead to cutting the ophthalmic; careless cleaning of the under surface of the ophthalmic might isolate the nasal nerve; and, through the density of the fibrous tissue of the outer wall of the cavernous sinus, this nerve would then probably adhere to the third nerve, and appear to be a branch of the latter. The author has noticed this appearance more than once.

The reader will now see the *rationale* of the following *résumé*:—

RESUME OF SUPERFICIAL DISSECTION OF THE ORBIT, AND PARTS IN THE OUTER WALL OF THE CAVERNOUS SINUS.

Fourth nerve dissected *backwards*,—forwards for a short distance, if found in the free edge of the tentorium.

Lachrymal nerve dissected backwards in the loose cellular tissue of the orbit, but *not further*; *not traced to its origin from the ophthalmic*.

Gasserian ganglion, &c.

Fifth nerve traced *forwards* in the outer wall of the cavernous sinus, but *not at first lifted up or cleaned on its under surface*. Origin of lachrymal nerve.

Trace third nerve forwards in outer wall of cavernous sinus. Where it approaches the fifth nerve in the vicinity of the anterior clinoid process, *carefully lift up the latter* nerve and push it outwards. Make out the upper and lower divisions of the third nerve, and the nasal branch of the ophthalmic as it passes forwards and inwards between them.

Sixth nerve in cavernous sinus.

There is no difficulty whatever in cleaning the sixth nerve, as it lies in the floor of the cavernous sinus, and in tracing it to the inner surface of the external rectus muscle.

MIDDLE AND DEEP DISSECTIONS OF THE ORBIT.

If the part is to be kept as a SUPERFICIAL DISSECTION of the orbit, it will be damaged by the dissection being taken *any further* than above described, except that the upper division of the third nerve may be traced into the levator palpebræ superioris & superior rectus.

The superficial dissection may now be transformed either into a dissection from the outer side, or into a middle dissection.

To make a MIDDLE DISSECTION of the orbit, divide the frontal & lachrymal nerves, and the levator palpebræ superioris, superior

rectus, and superior oblique muscles; and trace the nasal nerve and ophthalmic artery forwards & inwards above the optic nerve to the superior internal angle of the orbit, and clean their branches.

The lenticular ganglion and ciliary nerves can now be got out from above; but it is preferable to dissect these structures from the outer side. (*Vide* below.)

The middle dissection may now be transformed into a deep dissection.

To make a DEEP DISSECTION of the orbit, divide the optic nerve, turn the eyeball forwards, and trace the sixth nerve to the inner surface of the external rectus, and the lower division of the third nerve to the internal & inferior recti and inferior oblique.*

TRANSFORMING A SUPERFICIAL DISSECTION OF THE ORBIT INTO A DISSECTION FROM THE OUTER SIDE: LENTICULAR GANGLION.

Separate the soft parts from the outer wall of the orbit, and, with bone pliers, divide the malar bone into the spheno-maxillary fissure. Remove the back part of the outer wall of the orbit.

Divide the external rectus, and reflect it with the sixth nerve.

* For the purposes of either of these two dissections, or of the dissection from the outer side, the eyeball should be injected with wax.

Find the lower division of the third nerve. It is a large nerve running downwards & forwards to the internal & inferior recti and inferior oblique.

From its back part a short thick trunk, about an eighth of an inch long, will be seen running upwards & forwards to the ganglion. This is the short or motor root of the ganglion.

By carefully drawing the ganglion forwards, or by pulling carefully upon one of the ciliary nerves, a delicate filament about a quarter of an inch long will be seen to run forwards and slightly downwards from the nasal nerve to the ganglion. This is the long or sensory root.

The ganglion with the two roots above named, and the ciliary nerves, lie in extremely loose cellular tissue, and are quite easily cleaned.

The dissector is usually recommended to look for the lenticular ganglion by tracing one of the ciliary nerves backwards. In the writer's opinion, the way above described is much the better.

It is somewhat more difficult, however, to make out the sympathetic root, which is often blended with the long or sensory root.

Of the four dissections of the orbit, the only one at all difficult is the superficial dissection from above; the others are quite easy. When, therefore, a dissector has got a good superficial dissection of the orbit from above, he is strongly recommended not to hastily transform it either into a middle dissection, or into a dissection from the outer side. Neither should a middle dissection be inconsiderately transformed into a deep one. Students co-operating a little in the matter of orbits, there will always be previous external and deep dissections, and probably some middle dissections, whose authors, B. & C. & D., will be glad to study the superficial dissection of A., while A. can benefit by studying their more advanced work before conducting his own dissection through its final stages.

VII.

SUB-OCCIPITAL REGION—SCALENI MUSCLES,
AND DEEP MUSCLES OF THE FRONT OF
THE NECK.

Tense the trapezius either by flexing the neck, or, better, by forcibly rotating the part so that the face looks over the shoulder of the side being dissected. This can easily be done with the callipers. Tense and clean first one trapezius and then the other.

The fascia over the upper part of the trapezius is extremely dense. Be careful, therefore, of the thin outer edge of the muscle, which is easily missed.

The great occipital nerve pierces the trapezius quite at its upper part, just below its insertion into the superior curved line of the occipital bone, and is not easy to find in the dense fascia referred to. But by relaxing the muscle, and raising its edge, the nerve may be seen beneath it, piercing the complexus; and can then easily be traced through the trapezius and on to the back of the head.

Reflect both trapezii inwards, dividing them transversely on a level with the superior angle of the scapula.

Clean on both sides the splenius and the levator anguli scapulæ, and such portion of the complexus as is exposed. The fibres of the two former muscles are oblique upwards & outwards; those of the complexus are vertical.

Remove, on one side, the splenius, levator anguli scapulæ, parts of the rhomboideus & serratus posticus superior, and the complexus.

In the subjacent mass of loose fat, feel for the prominent

spinous process of the axis. Towards it there converge from below the upper fibres of the multifidus spinæ, and from it there diverge superiorly the inferior oblique and the rectus capitis posticus major.

Beneath the latter muscle is the rectus capitis posticus minor. From the outer extremity of the former (transverse process of the axis) the superior oblique passes almost directly upwards.

The great occipital nerve will be seen winding round the lower border of the inferior oblique, and crossing the triangle formed by the small posterior cranio-vertebral muscles.

Within the triangle will be seen the vertebral artery running horizontally inwards upon the posterior arch of the atlas.

Between the artery & the bone, there will be seen the posterior branch of the sub-occipital nerve entering the triangle, and supplying the three small muscles and the complexus.

With a little care, there will be seen the anterior division of the same nerve as it passes forwards on the inner side of the vertebral artery and rectus lateralis muscle, and also the ganglion on its posterior root.*

* It is a good plan to find the roots of the sub-occipital nerve within the spinal canal as they arise from the upper part of the side of the cord.

The ganglion on the posterior root of the second cervical nerve is as large as a small pea, and cannot be missed if properly looked for.

The *scaleni* muscles and the deep muscles of the front of the neck are left attached when the section of the pharynx is made. These can now be cleaned.

VIII.

PHARYNX AND SOFT PALATE.

The section of the pharynx (*quod vide*) to be made after the dissection of the triangles of the neck, face, pterygo- and sub-maxillary regions.* (The orbit & sub-occipital region can be dissected either before or after the section.)

If a good pharynx is to be obtained, special attention must have been paid, in dissecting the face, to the orbicularis oris & buccinator, and, in dissecting the deeper parts of the neck, to the stylo-glossus & -pharyngeus muscles and glosso-pharyngeal nerve. The digastric & stylo-hyoid muscles should be preserved, as they constitute valuable supports to the pharynx when dissected.

Pharynx to be well and evenly distended with small balls of tow introduced both through the mouth and through the œsophagus; lips to be stitched together.

Clean the buccinator as far backwards as you can beneath the masseter, removing the "*boule graisseuse de Bichat*;" cut away the masseter.

Remove the deep temporal fascia and the temporal muscle, tearing the muscle away from beneath the zygoma.

* If the above dissections are good ones, it seems preferable to preserve them, and to give a fresh "part" for the pharynx and soft palate

If a fresh part has been taken for the dissection of the pharynx, saw off the coronoid process; also disarticulate the condyle of the lower jaw, and remove it with the external pterygoid, sawing the neck of the bone.

Carefully remove the internal pterygoid.

Make out the pterygo-maxillary ligament in the line of junction of the buccinator and superior constrictor of the pharynx.

Clean the tensor palati.

Now proceed to clean the constrictors of the pharynx and the stylo-pharyngeus, working from below upwards.

Preserve the insertions of the omo- and sterno-hyoid and -thyroid and the thyro-hyoid, and the superior & recurrent laryngeal nerves.

When the upper border of the superior constrictor has been reached, remove the mucous membrane and fibrous bag of the pharynx, defining the upper border of the superior constrictor and the cranio-pharyngeal ligament, and clean the levator palati muscle.

The pharynx being opened in the middle line, and the palato-pharyngeus being tensed by drawing the thyroid cartilage downwards, remove the mucous membrane from off this muscle,

carefully defining its two heads of origin and the insertion of the levator palati, which they embrace.

A thick stratum of glandular tissue must be removed from off the back of the soft palate and azygos uvulæ, which latter must be tensed, while being cleaned, by traction on the uvula.

The palato-glossus must be cleaned from within the mouth, the base of the tongue being depressed.

The fleshy portion of the tensor palati has already been seen ; the reflection of its tendon will easily be made out.



II.

UPPER LIMB.

I.

AXILLA & FRONT OF ARM.

Arm drawn away from side.

Skin incisions:—Down middle of sternum, across lower part of axilla, along whole length of clavicle, *down whole length of front of arm to two inches below bend of elbow.*

This long incision down the front of the arm will facilitate the dissector's work. The axilla should be taken along with the front of the arm, one dissection being a help towards the other.

It is scarcely worth while looking for the cutaneous nerves (superficial descending branches of the cervical plexus),* but the *cephalic vein* should be found between the pectoralis major and the deltoid, and it should be carefully traced with the accompanying *descending branch of the acromio-thoracic artery.*

Clean the pectoralis major down to its lower border.

There is a sudden transition, opposite the lower border of the pectoralis major, from the laminated fascia covering the muscle to the loose cellular tissue which fills the axilla. As soon as the change takes place, the dissector has come to the level at which he should begin to look for the intercosto-humeral nerve.

Look for the *intercosto-humeral nerve* by tearing the cellular

* These should be looked for in the posterior triangle of the neck. It may be well for the dissector of the arm to wait a little for the dissector of the head & neck. When the latter has found these nerves in the posterior triangle, they can be traced with ease on to the front of the chest,—to the advantage of both dissectors.

tissue of the axilla transversely with forceps & finger-nail. The nerve will be found behind the lower border of the pectoralis major, just where the muscle is leaving the thoracic wall.

The nerve should be traced *a good long way* down the inner and back part of the arm, and its anastomosis made out with the *lesser internal cutaneous nerve*. If only a small portion of the nerve be cleaned, the dissection of the posterior wall of the axilla will be greatly impeded. There may be two intercosto-humeral nerves.

Now clean the lower edge of the latissimus dorsi. This will be the easiest & safest way of getting into the loose cellular tissue of the axilla, to clear away which the dissector should use finger & forceps rather than knife.

The lateral cutaneous branches of the intercostal nerves may now be sought for and cleaned.

First the pectoralis major, and then the pectoralis minor, should now be cleaned, and then divided a short distance from the ribs.

To clean the axilla without dividing the pectoral muscles is attempting an unnecessarily difficult task, and one involving a great sacrifice of time. In dividing the muscles, the lower & thinner part of the costo-coracoid membrane will of course be sacrificed, but the upper and thicker part of the membrane will remain.

At the upper part of the axilla it will generally be desirable

to divide the internal and external anterior thoracic nerves near where they enter the pectoral muscles. Preserving them makes it difficult to clean the upper part of axillary vessels and nerves.

Clean well the branches of the axillary artery, including the *anterior circumflex*, removing all the corresponding venæ comites,—*not* the axillary vein, nor the basilic. The anterior circumflex artery is a small branch, which passes outwards beneath the biceps and coraco-brachialis in front of the tendon of the latissimus dorsi.

At the back part of the axilla, clean the nerve of Bell, or posterior or long thoracic, the three subscapular nerves, and the subscapular artery with its dorsalis scapulæ branch.

It is no easy matter to thoroughly clean the vasculo-nervous bundle, and the deeper parts of the axilla. The finger introduced beneath the vasculo-nervous bundle from the outer side—between the bundle & the thick upper part of the costo-coracoid membrane—affords very considerable help. The bundle being thus lifted up (see foot-note, p. 19), not only ought the trunks to be cleaned—each one separately and all round—with relative ease, but the subscapular artery and the three subscapular nerves ought without much difficulty to be taken to their respective terminations.

Separate well the latissimus dorsi, teres major, subscapularis, and long head of the triceps, and open up the triangular and quadrilateral spaces between them; but the cleaning of the dorsalis scapulæ artery and of the circumflex nerve and posterior circumflex artery can only well be completed from behind when the parts about the shoulder are dissected.

At the lower part of the arm trace out the *inferior profunda* and *anastomotica magna* arteries as they perforate the

internal intermuscular septum. The former accompanies the ulnar nerve; the latter arises from the *inner side* of the brachial artery towards the lower part of the arm.

II.

FRONT OF FOREARM & PALM OF HAND.

At the bend of the elbow preserve carefully the *radial recurrent* and *anterior ulnar recurrent arteries*.

The *superficial veins* can scarcely be kept *in situ*, as they would greatly impede the deeper dissection. The cephalic & basilic veins should, however, be left attached superiorly, so that they may be put back into position when the part is required for subsequent study.

Take superficial dissection of palm of hand along with the dissection of the front of the forearm. One dissection helps the other considerably.

The superficial dissection of the palm of the hand somewhat resembles that of the sole of the foot, an important difference resulting, however, from the fact that, while the arteries & nerves of the sole of the foot are, at first, quite deeply situated, those of the palm of the hand enter the region almost as superficial structures. While, therefore, the sole of the foot should be taken as a separate dissection—*i.e.*, irrespectively of the back of the leg—the palm of the hand is, for dissection purposes, the natural continuation, so to speak, of the front of the forearm.

Cut down upon the upper part of the palmar fascia as it extends forwards from the anterior annular ligament over the upper two-thirds of the palm, and trace out the digital slips.

It is between these slips that the digital arteries & nerves are to be looked for. They are more superficial, and will be found more easily than those of the toes. In this situation,

arteries & nerves are on the same level; on the fingers the nerves are superficial to the arteries; higher up in the palm the arteries are superficial to the nerves.

The palmar fascia, whether in its central or its two lateral portions, is thin as compared with the plantar fascia, and conceals but incompletely either the superficial palmar arch & digital arteries, or the divisions of the median & ulnar nerves. The slips to the fingers are also farther apart than those to the toes, and proportionately longer, so that the digital arteries & nerves are subcutaneous in the full lower third of the palm.

Clean the superficial palmar arch, taking care of the *superficialis volæ* branch of the radial artery.

The dissector must now face a position which, in his first dissections, may somewhat try his patience. In dissecting the palm of the hand, as in dissecting the sole of the foot (and the remark applies also to the dorsum of the foot, and also, though less forcibly, to the dorsum of the hand), he must, if good work is to be done—*i.e.*, if the deeper parts of the hand, forearm, & bend of the elbow are to be adequately dissected—dissect, in a way, the same thing *ten times over*. He must trace both the digital nerve & digital artery on either side of each digit at least as far as the middle of the second phalanx, and thoroughly lift both up; and he must open up the sheath of the flexor tendons down to the tip of each finger. If the digital arteries & nerves are not thoroughly got out and lifted up, the lumbricales cannot be reached efficiently; and if these, in their turn, are not thoroughly cleaned and lifted up, each with the corresponding deep flexor tendon, then the deep palmar arch cannot properly be reached,—unless, of course, the flexor tendons be cut—a procedure which would utterly spoil the part for subsequent study.

Much may be done, however, to minimise the labour of this ten-fold dissection.

The digital nerves and arteries should be traced from the palm down the side of each finger, not by two lateral incisions, but by one median incision made straight down to the sheath of the flexor tendon, the flaps of skin & fascia being kept opened out on either side by hooks and clamps. The dense fascia which overlies each neuro-vascular bundle is thus avoided, and the nerve & artery have simply to be turned out of loose connective tissue; an additional advantage being that the tendons are half dissected by the time the nerves & arteries are turned out.

It may be noticed that, as the considerable width of the web between the thumb & index somewhat increases the difficulty of finding the trunks to these digits in the web, it may be a saving of time, if the trunks are not quickly found in the web, to seek the terminal branches by the side of the digits by the median

incision above described, and then to trace these back to the trunks. The remark applies also to the nerve which supplies the inner side of the little finger.

Take care of *deep or communicating branches of ulnar artery and ulnar nerve* at upper part of hypo-thenar eminence.

Some difficulty is often experienced in cleaning these branches as they dip down between the abductor & flexor brevis minimi digiti a little below and to the outer side of the pisiform bone. The palmaris brevis being first reflected outwards upon the central part of the palmar fascia, separate, at the inner boundary of the hypo-thenar eminence, the two conjoined superficial muscles from the subjacent adductor,—beginning below, where the two superficial muscles are tendinous, and working upwards. Thus get beneath the two superficial muscles. The interval between them will then be apparent superiorly, one muscle (the abductor) arising from the pisiform bone, and the other (the flexor brevis) arising from the unciform process of the unciform. The muscles being well separated, the artery and nerve passing between them will be traced without difficulty.

Trace radial nerve, and dorsal cutaneous branch of the ulnar, to the back of the hand, and fingers.

Trace radial artery to the back of the wrist beneath the extensor tendons of the thumb.

This is anticipating somewhat on the dissection of the back of the forearm, but for a good and justifiable reason. It is desirable that the smaller structures of the back of the hand be dissected early, as the soft parts, being thin in this region, dry very quickly. The dissector is recommended, however, if, through the part showing signs of drying, it becomes desirable to thus anticipate, to be careful about the termination of the posterior interosseous nerve, which is the structure most liable to be injured in this anticipated dissection.

As the branches of the radial nerve cross the radial artery at the back of the wrist, the dissector will of course see the importance of cleaning the nerve before the artery.

Radial artery traced towards palm of hand between the two heads of the first dorsal interosseus muscle, or abductor indicis.

The dissection of the thenar & hypo-thenar eminences should

now be completed; the muscles of the thumb & little finger being thoroughly separated so as to allow of the cleaning both of the radial artery as it enters the palm, and also of the deep or communicating branches of the ulnar artery & nerve.

To show thoroughly how the radial artery passes from the outer & back part of the wrist into the palm of the hand, the dissector should open up the several inter-muscular spaces from behind, from below, and from in front. From behind, he should well separate the two heads of the first dorsal interosseous muscle or abductor indicis; from below, he should lift up, and clean underneath, the adductor pollicis; from in front, he should carefully separate the fore-named muscle from the flexor brevis.

To complete the dissection of the deep palmar arch, the anterior annular ligament should be divided (it should be divided internally to the insertion into it of the palmaris longus tendon), and the flexor tendons, lumbricales, arteries, & nerves should be well lifted up; the sheaths of the tendons being first examined and then cleared away. This is also a *sine quâ non* condition of the efficient cleaning of the deeper structures of the front of the forearm & bend of the elbow.

The dissector will understand that it was to allow of the superficial structures being lifted up, as above explained, that their several prolongations to the fingers had all to be thoroughly cleaned in the early stages of the dissection.

III.

DEEP DISSECTION OF BEND OF ELBOW.

In its deeper prolongations, the space at the end of the elbow may be considered, from the dissector's point of view, to break up into five passages, each of which should be carefully opened up. These are:—

(1) The passage between the two heads of the pronator radii teres traversed by the median nerve;

(2) The passage between the middle & outer heads of the flexor sublimis traversed by the ulnar artery. These two passages first unite inferiorly, and then from the common channel thus formed there branch off,—

(3) Upwards & inwards, the passage between the two heads of the flexor carpi ulnaris, in which lie the upper part of the ulnar nerve & the posterior ulnar recurrent artery ;

(4) Backwards, the passage between the upper border of the interosseous membrane and the oblique or round ligament, through which the posterior interosseous artery gets to the back of the forearm ; and

(5) Downwards, the broad and open valley running down the front of the interosseous membrane between the two deep flexor muscles, down which there run, within easy reach of the dissector, the anterior interosseous artery & nerve.

The anterior annular ligament of the wrist having been divided, and the flexor tendons, lumbricales, arteries, & nerves lifted up, as already explained, the dissector should separate the muscles arising from the inner condyle well up to their origins, and then lift up the flexor sublimis at its inner edge, but *without dividing its origin from the radius*. He should then forcibly flex the hand & fingers, and keep them in the flexed position by means of hooks & clamps.

This will allow the dissector—(passages 1 and 2, containing the median nerve and the upper part of the ulnar artery, having first been opened up from the front)—to open up passages number 3 and number 5, and to clean (A) the posterior ulnar recurrent artery as it passes up beneath the flexor sublimis and then between the two heads of the flexor carpi ulnaris in company with the ulnar nerve, and (B) the common interosseous and anterior interosseous arteries, with the interosseous branch of the median nerve

There remains passage number 4 between the upper border

of the interosseous membrane & the oblique or round ligament, traversed by the posterior interosseous artery. It will considerably facilitate the dissection of this artery if the passage is opened up both from the front and from the back. The superficial dissection of the back of the forearm being completed, and the artery being traced to the upper border of the interosseous membrane, a probe should be passed from before backwards along the course of the artery, which will thus easily be found in the upper & back part of the forearm.

IV.

BACK OF FOREARM.

If not already done (see page 66), trace radial nerve, and dorsal cutaneous branch of ulnar, to back of hand and fingers; and trace radial artery to back of wrist beneath extensor tendons of the thumb.

Trace extensor tendons of fingers to bases of second and third phalanges.

Divide posterior annular ligament of the wrist, raise above-mentioned tendons and lower part of corresponding muscles, and clean the deep muscles of the back of the forearm (*extensores ossis metacarpi pollicis*, *primi* and *secundi internodii pollicis*, and *indicis*) as they emerge from between the superficial extensor muscles, and the tendons of the *extensores carpi radiales longior & brevior*.

Posterior carpal arch; termination of anterior interosseous artery.

Find the terminal portion of the posterior interosseous nerve beneath the extensores indicis & communis digitorum, and trace it upwards with the posterior interosseous artery.

Thoroughly separate the extensor muscles up to the outer condyle, clean the anconeus & supinator brevis, and trace the interosseus recurrent artery beneath them (see page 68).

V.

PARTS ABOUT SHOULDER.

Clean the deltoid, and make out the bursa beneath it. The arm being abducted, it is quite unnecessary to divide the muscle.

Carefully separate the teres minor from the infra-spinatus, teres major, and long head of the triceps, so as to open up the triangular and quadrilateral spaces; and complete the cleaning of the dorsalis scapulæ artery, and of the posterior circumflex artery and circumflex nerve. On the branch of the latter to the teres minor a small ganglion should be found.

It is sometimes difficult to separate the teres minor & infra-spinatus. It is towards their insertion into the humerus, where they become tendinous, and the interval between them is greatest, that it is easiest to separate them.

If the head and neck have been dissected, complete the cleaning of the trapezius. Detach it from the spine of the scapula and lift it up, and clean the supra-spinatus, and the scapular attachments of the levator anguli scapulæ and omo-hyoid. With the latter, clean the adjoining part of the supra-scapular artery and nerve as they pass respectively, the former over, the latter through, the notch in the upper border of the scapula. *Do not divide the upper part of the trapezius.*

III.

THORAX.

T H O R A X.

The thorax being widely opened, as it is our mode of presenting it, first find the two phrenic nerves, the two pneumogastric nerves, and the thoracic duct.

The two phrenic nerves will be seen passing down in front of the root of the lung, and by the side of the pericardium.

The left pneumogastric will be seen crossing the arch of the aorta, and then getting to the back of the root of the lung.

The right pneumogastric is more deeply situated and less easy to find. It must be looked for by the side of the trachea, in the midst of a good deal of loose cellular tissue. It will be seen to pass behind the root of the right lung.

The thoracic duct should be looked for and secured before anything has been disturbed in the lower part of the thorax. Turning the right lung over to the left of the middle line, the vena azygos will be seen passing up on the right side of the bodies of the vertebræ. The thoracic duct will be found running up between this and the aorta. It lies in a little loose cellular tissue *in front* of the right intercostal arteries. It has the appearance of a small vein.

Trace the two phrenic nerves in front of the root of the lung, and by the side of the pericardium.

Trace the left pneumogastric nerve across the arch of the aorta, behind the root of the lung, and upon the front of the œsophagus; the pulmonary branches need not be traced out for any great distance.

Clean the vena azygos major, and trace it over the root of the right lung into the superior vena cava.

Trace up the thoracic duct as far as convenient.

Trace the right pneumogastric nerve behind the root of the lung, and upon the back of the œsophagus.

Clean the œsophagus in the lower part of the thorax, being careful of the two vagi; it is most accessible on the left side.

Trace up the thoracic duct behind the œsophagus.

Clean the innominate veins & the superior vena cava.

Clean the outer surface of the pericardium, and trace the serous layer upon the aorta and pulmonary artery, and upon the venæ cavæ and pulmonary veins.

Remove the pericardium, and clean the roots of the lungs in front and behind, thoroughly separating one from the other, the vein, the artery, and the bronchus, and cleaning each separately.

Clean the arch of the aorta and the upper part of the thoracic aorta; and turn the arch of the aorta over to the left, so as to get behind it.

Trace the left recurrent laryngeal nerve beneath, and then behind, the arch of the aorta, and in the groove between the trachea and the œsophagus. It passes on the left side of the ductus arteriosus.*

Find the upper part of the thoracic duct on the left side of the œsophagus, and behind the left subclavian artery. It lies behind and to the left of the left recurrent laryngeal nerve. It should be traced carefully from below.

Lift up well what remains of the sternum (in our way of opening the thorax) by means of a hook reflected over a block, and clean the innominate, left common carotid, and left subclavian arteries, being mindful of the recurrent laryngeal nerve and of the thoracic duct.

Clean the trachea, and the commencement of the bronchi.

* The ductus arteriosus greatly interferes with the cleaning of all the deeper structures at the upper part of the thorax, and more particularly of the left recurrent laryngeal nerve, thoracic duct, œsophagus, trachea, and the root of the left lung. It is, however, an important landmark, which must not be done away with. If carefully ligatured in two or three places, both near its pulmonary extremity and near its aortic extremity, with *fine strong twine*, it may be divided between the ligatures, and, when the dissection of the above-named structures is completed, the two halves of the duct may be tied together. For the ligatures to hold, it is necessary that they be such as are above described, and that they be applied *before the duct is divided*. In tying together the two halves of the divided duct, the dissector will of course be careful to so tie them that they lie on the *right side* of the left recurrent laryngeal nerve.

Clean the lower part of the thoracic aorta; the cord of the sympathetic, and the splanchnic nerves; the intercostal vessels, the vena azygos minor, and the left upper azygos, if the latter exist.

The cardiac arteries and veins may be traced out on the heart *in situ*; but the heart should neither be removed nor opened. A separate heart will be supplied for the study of the interior of the organ.

IV.

ABDOMEN.

A B D O M E N .

After having dissected the parts concerned in inguinal hernia, the broad muscles of the abdomen, and the mesenteric arteries, and having removed these latter arteries, with the small and large intestines, the dissector should aim at getting out all the deep relations of the organs of the abdomen *down to the crura of the diaphragm, in one preparation*. The crura of the diaphragm should be thoroughly exposed without the removal of any important structure, except the solar plexus, which latter should of course be examined before it is removed.* This will require careful work ; but the dissection, when finished, will amply repay for the labour spent upon it. The dissection should be divided into six stages, as follows:—

1. By the removal of the lesser omentum, the dissector should first expose the trunk of the cœliac axis, and trace out the commencement of the hepatic and splenic arteries, and the whole course of the gastric artery with its anastomosis with the pyloric. With the hepatic artery will be found the ductus communis choledochus, and the trunk of the portal vein.

2. The dissector should now remove the great omentum from the *anterior* aspect of the arterial arch which runs along the greater curvature of the stomach (gastro-epiploicæ dextra and sinistra), and make out the vasa brevia.

3. The dissector should now free the spleen and the tail of

* The two structures most likely to be removed inadvertently are the two spermatic and the two inferior phrenic arteries. The dissector should be mindful of them.

the pancreas from their deep attachments. Turning these up with the stomach (without stretching too much the delicate vasa brevia), he will get more thoroughly at the celiac axis, and will be able to trace out fully the splenic artery and vein, and to make out the origin of the vasa brevia and of the gastro-epiploica sinistra.

This is the time to trace out the pancreatico-duodenal arteries between and in front of the head of the pancreas & the descending portion of the duodenum.

This is also the time to be careful not to remove the long and delicate spermatic or ovarian arteries. It is well to look for them early, and to draw them out of harm's way. They will be found arising from the front of the abdominal aorta just below the renal arteries.

4. The head of the pancreas and the descending portion of the duodenum should now be freed from their deep attachments, and lifted up. Between and behind them will be found the lower part of the ductus communis choledochus, which latter should be traced up with the hepatic artery and the portal vein to the transverse fissure on the under surface of the liver.

5. The two kidneys should now be freed from the loose fatty tissue in which they lie, and turned over with the renal vessels towards the middle line of the abdomen. All the loose fatty tissue which surrounded the kidney should be removed; the renal vessels should be cleaned; and, on the right side, the vena cava should be traced up to the fissure in the posterior border of the liver.

The crura of the diaphragm, more particularly their tendinous portion, can now be got at on either side; they should be thoroughly cleaned with the aorta which lies between them.

6. The position of the inferior phrenic arteries should now be made out by feeling for them as they cross the fleshy portion of the crura of the diaphragm just above the cœliac axis. As soon as they are traced out, the subjacent fleshy portion of the crura, and the fibrous arch which unites the crura, can be cleaned without difficulty.

Every difficulty worth speaking of in connection with the deep dissection of the abdomen is now got over. The branches of the lumbar plexus will easily be found upon the psoas and quadratus lumborum muscles. As regards the parts at the brim of the pelvis, all that is wanted is a little care in cleaning the large arterial and venous trunks. The deep epigastric arteries require just a little attention as they pass upwards and inwards along the lower and inner boundaries of the internal abdominal ring, and are hooked round by vas deferens in the male, and by the round ligament in the female. The ligamenta arcuata can best be got out on the left side.

I.

FRONT AND INNER SIDE OF THIGH.

For the dissection of the parts concerned in femoral hernia, see page 108. These parts, with the small upper branches of the femoral artery & internal saphenous vein and the crural branch of the genito-crural nerve, should be dissected before the dissection of Scarpa's triangle proper is begun.

A vertical incision should now be made through the skin over the anterior & inner aspect of the thigh down to about four inches below the knee. This long vertical incision is preferable to the shorter vertical incision, combined with a transverse incision at its lower part, generally recommended. It endangers no cutaneous nerves, as transverse incisions do, and allows the dissector to free the whole length of the sartorius muscle in the early stages of the dissection—a step that will greatly facilitate the subsequent work.

In no part of the body can careful planning and thoroughness of work do more to make a difficult dissection relatively easy than in Scarpa's triangle and the front & inner side of the thigh.

In this dissection a double difficulty centres in the anterior crural & external cutaneous nerves.

(1.) The latter nerve and the cutaneous branches of the former have, at least in the usual way of dissecting the front of the thigh, to be found in the superficial fascia.

(2.) The deeper structures are railed off, so to speak, by a radiating pencil of muscular and cutaneous nerves, by which the deep dissection is everywhere greatly impeded.

As regards the anterior crural nerve, let the dissector get, to begin with, upon the undivided trunk *immediately below*

Poupart's ligament.* Then let him follow out the several branches one by one *to their termination*. He will thus gain two advantages.

(1.) He will identify the two cutaneous branches without having to look for them in the superficial fascia of the thigh: the middle cutaneous pierces the fascia, and generally the sartorius also, three or four inches below Poupart's ligament; the outer branch of the internal cutaneous pierces the fascia about the lower third of the thigh; the inner branch pierces the fascia a little above the inner side of the knee.

(2.) By tracing the muscular branches into the corresponding muscles, he will be enabled afterwards to draw them aside, so as the more easily to get at the deeper structures.

If the abdomen can be opened, both anterior crural and external cutaneous nerves can be found upon the psoas & iliacus, and then traced into the thigh beneath Poupart's ligament. Otherwise the external cutaneous nerve will have to be looked for in the usual way—*i.e.*, as it pierces the fascia a little below & internal to the anterior superior spine of the ilium.

* As the anterior crural nerve begins to give off branches very high up in the thigh, it is *quite the upper part of the nerve* that the dissector should expose.

If the limb is not suitable for the dissection of the parts concerned in femoral hernia, and if the dissector, having previously seen them, is willing to sacrifice also the small upper branches of the femoral artery & internal saphenous vein, and the crural branch of the genito-crural nerve, there is a very rapid way of beginning the dissection, which brings the dissector at once on the deeper structures:—Find the upper part of the internal saphenous vein through the upper part of the vertical incision above described. This will lead you upon the upper part of the femoral vein, which, with the adjacent artery, clean and lift up from off the pectineus muscle, dividing all the superficial structures. This can be done without dividing any branch of the anterior crural nerve; the highest branch of the nerve which runs inwards crosses the artery at least two inches below Poupart's ligament. The upper part of the anterior crural nerve, before it has given off any branch, will be found half an inch to the outer side of the artery. Now expose the whole length of the sartorius, and proceed to trace out the branches of the anterior crural nerve as above described. This procedure saves more than an hour in the dissection of the front of the thigh, but it should only be attempted by an experienced dissector.

The dissector's attention may now be turned first towards the outer, and then towards the inner part of the region.

In the OUTER PART OF THE REGION, the sartorius should be dissected quite up to its origin. Then the rectus should be followed up to the anterior inferior spine of the ilium (direct tendon), and freed inferiorly.

This done, the dissector can lift up the foregoing muscles and the outer branches of the anterior crural nerve, and trace the external circumflex artery in the mass of loose cellular tissue in front of the capsule of the hip-joint & neck of the femur.

The anterior border of the tensor vaginae femoris being freed, and the thigh being flexed so as to relax the muscles, the dissector can now get at the reflected tendon of the rectus.

In the INNER PART OF THE REGION, the superficial dissection may be distinguished from the deep.

As regards the *superficial dissection*, there is no difficulty, now that the branches of the anterior crural nerve, traced each *to its termination*, can be well drawn out of the way, in following out the femoral artery & vein and the internal or long saphenous nerve in Hunter's canal, and down to the opening in the lower part of the adductor magnus,—opposite

which opening a small part of the anterior wall of Hunter's canal should be left untouched.

As regards the *deep dissection*, the dissector should now free the gracilis and the adductor muscles from origin to insertion. This will save these muscles, which are very soft, from being torn, and will bring the dissector conveniently upon the profunda artery & its branches, and upon the anterior & posterior divisions of the obturator nerve.

Profunda artery traced out behind adductor longus; its perforating branches.

Internal circumflex artery traced out between pectineus & psoas. The terminal portion of the artery—that between the quadratus femoris & the adductor magnus—can only be made out in the dissection of the gluteal region.

In cleaning the branches of the femoral artery *remove all the venæ comites*; preserving them will, in nine cases out of ten, prevent their being traced to their termination. The femoral, politeal, and internal & external saphenous veins are the only ones that need be preserved in the lower limb.

Anterior division of the obturator nerve traced down to its anastomoses with the internal saphenous & internal cutaneous nerves.

Internal or long saphenous nerve perforating lower part of

anterior wall of Hunter's canal (which lower part should be preserved), and passing between sartorius and gracilis.

Freeing the upper border of the adductor magnus (the thigh being flexed and adducted) will expose the obturator externus muscle and the inner & outer branches of the obturator artery. But these parts can only be cleaned to advantage (unless the superficial structures be sacrificed, which is undesirable) after the dissection of the gluteal region, when they can be reached partly from the front and partly from the back.

II.

FRONT OF LEG AND DORSUM OF FOOT.

The dissection of the front of the leg is in itself quite easy, but it should be so planned as to facilitate as much as possible the more difficult and somewhat tedious dissection of the dorsum of the foot.

On the dorsum of the foot we have an extremely complex felting of somewhat uninteresting structures.

(1.) The venous arch, which opens, on the one hand, into the internal saphenous vein, and, on the other hand, into the external saphenous, crosses more or less transversely the terminations of the internal & external saphenous nerves and the radiating branches of the musculo-cutaneous.

(2.) The branches of this latter nerve cross the long extensor tendons in a direction forwards & inwards.

(3.) The long extensor tendons cross the tendons of the extensor brevis in a direction forwards & outwards.

(4.) The tendons of the extensor brevis cross the external branches of the dorsalis pedis artery and the external branch of the anterior tibial nerve more or less at right angles; while

(5.) The innermost tendon of the extensor brevis crosses in a direction forwards & inwards both the dorsalis pedis artery itself, and the internal terminal branch of the anterior tibial nerve.

We have therefore here a series of five successive strata, of which each one interferes with the dissection of those which are subjacent to it.

The average dissector will feel a strong inclination to sacrifice the more superficial structures. One can scarcely object to his sacrificing the venous arch when once he has dissected it; one would not regret very much either the sacrifice of the terminal filaments of the internal & external saphenous nerves. But the branches of the musculo-cutaneous nerve and all the deeper structures should be honestly got out and preserved. The dissection would be much damaged for future study if this requirement were neglected.

But if this is to be realised, no scamped work is admissible; the several traves of each stratum must be raised *from end to end*, in order that the dissector may get at the stratum beneath. First, the branches of the musculo-cutaneous nerve must be traced at least as far as the middle of the second phalanges; then the several tendons of the extensores longus* & brevis must be freed, and the body of the latter muscle must be cleaned and raised. *Then only* can the dissector get at the principal artery of the region, and its accompanying nerve.

The parts may be got out in the following order:—

Musculo-cutaneous nerve piercing deep fascia at junction of middle & lower thirds of outer side of leg. Trace as far as *middle of second phalanges*.

External saphenous vein and nerve behind the external malleolus, and on the other side of the foot.

It will facilitate this, and the subsequent stages of the dissection of the limb, to seek out now the communicantes tibialis and fibularis. The communicans tibialis will be found between the two heads of the gastrocnemius, beneath the external saphenous vein, or it may be traced from the internal popliteal nerve at the lower part of the popliteal space. The communicans fibularis, smaller & more variable, had better be traced from the external popliteal nerve as it

* The division of the anterior annular ligament greatly facilitates the lifting up of the long extensor tendons, and all the subsequent stages of the dissection.

lies on the outer side of the popliteal space close to the tendon of the biceps. When the above have been found, the external or short saphenous nerve will be traced without difficulty.

Divide anterior annular ligament.

Trace extensor tendons to bases of second and third phalanges.

*Internal and external malleolar arteries.**

Terminal portion of anterior peroneal artery, perforating lower part of interosseous membrane.

Lift up extensor brevis digitorum, and trace out branches of dorsalis pedis artery & outer branch of anterior tibial nerve.

Clean internal and external lateral ligaments of ankle-joint.

At the upper part of the leg, the recurrent tibial artery should be carefully cleaned as it runs upwards & inwards in the substance of the tibialis anticus; to this effect the tibialis anticus and the extensor longus digitorum should first be separated up to their origin from the head of the tibia. The large oval opening through which the anterior tibial artery passes from the back to front of the limb, should also be carefully made out; but this should be left till the popliteal space and back of the leg have been dissected, as the foramen can then be got at from the back as well as from the front.

* These arteries should be looked for with care, but not before the anterior annular ligament has been divided and the four muscles of the front of the leg have been raised. They vary a great deal in size, especially the inner one, which is often so small that it would probably pass unnoticed were not the dissector's attention directed to it.

III.

GLUTEAL REGION.

The author's very distinct experience of average dissections of the gluteal region is that, in addition to the liability common to most parts to be left unfinished, this has a liability of its own to get damaged. It presents many pitfalls to the inexperienced dissector. Though there is a distinct plane of loose fascia beneath the gluteus maximus, the dissector, in dividing the muscle, is much exposed to injure some of the parts beneath. Then there is the temporary indistinctness—till the fascia is removed—and the somewhat complex felting, of these subjacent structures. And they radiate also in many different directions from the great sacro-sciatic foramen, thus:—*Upwards & backwards*, superficial branches of the gluteal artery; *forwards*, and *forwards & upwards*, deep branches of the gluteal artery and superior gluteal nerve; *downwards*, sciatic vessels & nerves; *downwards & inwards*, pudic vessels & nerve, and nerve to the obturator internus, also inferior pudendal branch of the small sciatic.

The detailed instructions below given may be summed up in two general instructions: Raise the gluteus maximus with care, especially with regard to the small sciatic and inferior pudendal nerves; having raised it, define directly the great sacro-sciatic foramen by thoroughly exposing the great sacro-sciatic ligament.

Clean the gluteus maximus down to its *lowest fascicle*, and raise the latter with care, looking for the small sciatic nerve and its inferior pudendal branch; these lie between the tuber ischii & the great trochanter, nearer by a little to the former.

Find the upper edge of the gluteus maximus, and separate

it from the dense fascia which covers the upper part of the gluteus medius; this fascia should be preserved; it lies beneath a thick mass of fat filling up the hollow below the front part of the iliac crest.

Dissect underneath the gluteus maximus, starting from both its upper and lower edges, and divide the muscle towards its middle.

Dissect the muscle from off the great sacro-sciatic ligament, and thus clearly define the great sacro-sciatic foramen; this greatly facilitates the subsequent course of the dissection.

Define the lesser sacro-sciatic foramen, and the muscular intervals above & below the obturator internus & gemelli, separating these, on the one hand, from the glutei medius & minimus, and, on the other, from the quadratus femoris. Be careful of the small gemellus superior, which arises from the spine of the ischium. Separate with much care the gemelli from the obturator internus.

If the interior of the pelvis can be got at, it will greatly facilitate the deep dissection of the gluteal region to find the gluteal artery and superior gluteal nerve inside the pelvis, and to trace them outwards through the upper part of the great sacro-sciatic foramen. The nerve arises from the back of the lumbosacral cord behind the internal iliac artery and vein; be specially mindful of its superior branch, which is frequently lost in the course of the dissection. The internal iliac and gluteal veins are much in the way, and should be removed while the artery and nerve are being traced out.

Separate with care the anterior border of the gluteus medius

(covered by a thick layer of deep fascia) from the tensor vaginæ femoris, so as to preserve the inferior branch of the superior gluteal nerve, which goes to the tensor vaginæ femoris; this branch emerges from beneath the anterior border of the gluteus medius.

Divide the gluteus medius from before backwards towards its middle, tracing out the inferior branch of the superior gluteal nerve.

Gluteal artery and superior gluteal nerve with their deep branches, superior & inferior.

Sciatic artery & great sciatic nerve; small sciatic nerve; inferior pudendal nerve.

Pudic artery & nerve, and nerve to obturator internus as they cross spine of ischium; trace same into ischio-rectal fossa.

Hamstring muscles and great sciatic nerve. Clean posterior surface of adductor magnus.

Now is the time to complete the dissection of the internal circumflex artery, the obturator externus muscle, and the upper part of the adductor magnus. The termination of the artery appears between the adductor magnus and the quadratus

femoris, which latter muscle should be carefully cleaned underneath and well lifted up, so as to allow the dissector to get at the above-mentioned structures.

IV.

POPLITEAL SPACE.

In the dissection of the popliteal space the superficial structures again stand much in the way of the deeper ones, but in a manner different from that noticed in the regions of the lower limb already studied. Here the superficial structures do not, to any marked extent, cross the deeper ones; they simply lie in front of them. The principal vessels & nerves form one large vasculo-nervous bundle, and nothing more. Here is emphatically a case for the dissector to get behind the vasculo-nervous bundle, and to the sides of it, so as to clean it all round.

The dissector, having already got out the external or short saphenous vein and the two heads of origin of the external or short saphenous nerve, and thus opened up the popliteal space superficially, should now dissect wide of the space itself. He should clean, and raise, the inner & outer heads of the gastrocnemius in search of the two inferior articular arteries; the inner one he will find running downwards & inwards upon the head of the tibia, and, if not seen at once, distinctly perceptible, at least, to the finger; the outer one he will similarly find running directly outwards above the head of the fibula. By similarly cleaning and raising, on the one hand, the biceps, and, on the other, the semi-tendinosus and -membranosus, he will also, without difficulty, come upon the two superior articular arteries. These lie close upon the femur, a little above the condyles, in the midst of a large amount of loose

fatty tissue. They cannot usually be seen at once, but they can be felt by pressing the finger on the bone in the situations named.

Flexing the limb slightly, so as to relax the muscles, the dissector should now pass his finger beneath these both in the upper & in the lower part of the popliteal space, and thus isolate the vasculo-nervous bundle in front and at sides.

Little more need be said here. Following out the general principles which he has frequently applied before, the dissector will have no difficulty in cleaning the several structures, and then in removing the mass of fat in which they lie.

The superior internal articular artery should be traced beneath the tendon of the adductor magnus.

The azygos articular artery will be found arising from the front of the popliteal, and piercing the posterior ligament of the knee-joint.

The three insertions of the semi-membranosus.

Tendon of biceps splitting to embrace long external lateral ligament of knee-joint.

All the structures in the popliteal space being cleaned, and the fat removed. the posterior surface of the femur, where it forms the floor of the popliteal space, should be scraped clean with the handle of a forceps.

V

BACK OF LEG.

External or short saphenous vein; communicantes tibialis & fibularis, & external or short saphenous nerve.

Divide heads of gastrocnemius, and cut away soleus from its origins, *leaving part of each of these and the fibrous arch between tibia & fibula.*

To do this, make two vertical cuts through the muscle, the one half an inch internal to the posterior surface of the fibula, and the other half an inch external to the inner border of the tibia. Then join these by an arched incision, concave inferiorly, running half an inch below the oblique line of the tibia and the fibrous arch between the tibia & fibula, beneath which pass the posterior tibial vessels & nerves,—thus leaving this arch *in situ*.

In dissecting the deep muscles of the back of the leg, it should be noticed that both the flexor longus digitorum and the flexor proprius pollicis overlap the tibialis posticus to a considerable extent.

Parts behind inner ankle. “Timothy doth vex all very nervous people.”

VI.

SOLE OF THE FOOT.

This much-neglected region, generally considered very difficult, is really quite easy to dissect, if only the dissector will stand the slight trial to his patience involved in the ten-fold dissection of the digital arteries & nerves already referred

to in connection with the dissection of the palm of the hand. Even this little trial is lighter in this case than in the case of the hand: the digital nerves are shorter, and it is somewhat less necessary to get out all the digital arteries. It is as imperative, however, as in the case of the hand, that all the digital nerves be dissected.

The first thing to do in dissecting the sole of the foot is to make an incision along the middle line straight down to the plantar fascia. This incision should be begun *on the os calcis*, to which the fascia is attached posteriorly, and which will indicate the depth at which the fascia is to be found. If the knife is entered anteriorly, there is danger of the fascia being cut through, and the subjacent muscles damaged.

The fascia should now be cleaned forwards till it is seen, about an inch behind the metatarso-phalangeal articulations, to divide into the slips to the toes. Between these slips, and corresponding to the intervals between the toes, the subcutaneous fat changes character. From being dense, hard, & granular, it suddenly becomes quite soft; and, from having been previously bound down by the undissected fascia, it comes, as soon as this is removed, to project in, so to speak, four soft cushions. It is beneath these cushions that the dividing trunks of the digital nerves will be found, accompanied by the digital arteries, which lie a little deeper.

If good work is to be done—*i.e.*, if the deeper parts of the sole of the foot are to be adequately dissected—the dissector must now trace the digital nerves on the sides of each digit at least as far as the middle of the second phalanges, and he must thoroughly lift them up.* As the plantar arch is not a superficial structure standing in the way of other parts, it is less

* This should be done as indicated in reference to the nerves of the fingers, page 65.

important than in the case of the hand, to dissect all the digital arteries.

The dissector must now find the lumbricalis muscle on the inner side of each digit, beneath the corresponding nerve, and must clean and lift every one of these four small muscles.

Finally, he must open up the five tendinous sheaths, and turn out all the short and long flexor tendons.

If all this be not thoroughly done, it will be impossible, later on, to properly turn down the superficial muscles, so as to get at the deeper structures.

The dissector should now remove the plantar fascia, and clean the superficial layer of muscles, opening up the intervals on either side of the flexor brevis, so as to trace the plantar vessels & nerves from the back part of the foot. Much care should be bestowed, in the interval between the flexor brevis & the abductor pollicis, upon the internal plantar artery, which is often quite small, and easily damaged.

The three superficial muscles should now be lifted up as far back as their origin from the os calcis, care being taken not to damage the subjacent vessels & nerves, and a saw should be passed beneath them so as to detach the portion of bone from which they arise.

The first layer of muscles being now turned down, the muscles of the second layer can be sufficiently relaxed (by

extending the foot and flexing the toes) to allow of the cleaning of all the remaining structures. If it is thought necessary, however, to divide the flexor longus digitorum, the best place at which to divide it is between the insertion into it of the flexor accessorius, and the point at which it divides into the four tendons to the toes.

Be careful of the transversus pedis, which is quite superficial, after the muscles of the first layer have been turned down; and of the small outer head of the flexor accessorius, which crosses the under surface of the long plantar ligament.

Trace the external plantar artery and the deep branch of the external plantar nerve beneath the adductor pollicis.

Separate and lift up the two heads of the flexor brevis pollicis.

VI.

APPENDIX.

I.

PERITONEUM & ISCHIO-RECTAL REGION.

It is by no means difficult to show the prominent features of the perinæum & ischio-rectal region, provided the transversus perinæi muscle be well developed; but this muscle is extremely variable, and not unfrequently so small as to be almost unrecognisable. The whole of the superficial dissection should be so planned, therefore, as to make the dissector sure of finding such representative of the muscle as may be present.

The two regions should be taken together; it adds materially to the difficulty of the dissection to take them separately.

It is a mistake, also, to place the body, *to begin with*, in the lithotomy position, – this position not being the most convenient for exposing the inferior pudendal nerve, or the back part of the sphincter and levator ani, coccygeus, and pudic vessels & nerve.

To find the inferior pudendal nerve, place the body on the abdomen at the end of the table, and let the legs hang down. Then make an incision from a little behind the tip of the coccyx towards a point two inches below the great trochanter, and thoroughly expose the lower edge of the gluteus maximus. The nerve will be found emerging from

beneath the muscle below the tuberosity of the ischium. Trace it to the perinæum when the body is in the lithotomy position.

To begin the dissection of the sphincter and levator ani, coccygeus, and pudic vessels & nerve, open the abdomen in the middle line, fully distend the rectum from above & from below, stitch up the anus, fill the cavity of the pelvis with sponges or any soft material, and raise the pelvis as a whole, not on ordinary blocks, but by means of a cylindrical block just large enough to go into the pelvis (a large jam-pot will do very well as a substitute), which shall depress the tissues of the perinæum as in a "bearing-down" effort. The parts are now prominent and well tensed.

An incision round the anus will expose the few radiating fibres which constitute the corrugator cutis ani.

Prolonging the incision backwards and forwards, make out the fibres of the sphincter ani as they arise from the tip of the coccyx, and trace them *very carefully* towards the central tendinous point of the perinæum.

The posterior fibres of the levator ani are nearly parallel to those of the sphincter; its more anterior fibres join those of the sphincter nearly at right angles.

Make out the inferior hæmorrhoidal vessels & nerve.

Make out the pudic vessels & nerve as they enter the ischio-rectal fossa posteriorly, crossing inferiorly the spine of the ischium, lesser sacro-sciatic ligament, and coccygeus muscle.

Trace the superficial perinæal vessels & nerve *very carefully* forwards, bearing in mind that they not unfrequently perforate the transversus perinæi muscle. Clean the transverse perinæal vessels.

Now place the body in the lithotomy position, and dissect the perinæum proper.

The superficial, or thick and fatty layer, and the deep, or thin and laminated layer, of the superficial fascia of the perinæum will easily be made out, – the deep layer binding down the two prominent, and apparently large muscles of the region, the accelerator urinæ and the erector penis.

The transversus perinæi has barely been referred to up to the present, but it has not been forgotten. It may have been seen through the fascia when the fibres of the sphincter ani were traced forwards towards the central tendinous point of the perinæum, or when the superficial perinæal vessels & nerves were traced forwards from the ischio-rectal fossa, or when the transverse perinæal vessels were traced inwards behind the position the muscle should occupy.

If it has not yet been perceived, it is probably very small. In this case, remove, on one side, the deep layer of the superficial fascia of the perinæum from off two muscles above named, and carefully reflect it backwards. This will expose what may exist of the transversus perinæi.

Carefully separate the three superficial muscles of the perinæum, and thus expose the inferior layer of the deep perinæal fascia, or triangular ligament. Notice that it is attached to the rami of the pubes & ischium *internally* to the crus penis.

Divide the inferior layer of the deep perinæal fascia internally to the crus penis and rami of the pubes & ischium, expose the structures contained between its two layers, namely, the compressor urethræ muscle surrounding the membranous portion of the urethra (which should be distended with a soft catheter), the deep transversus perinæi (often absent), the pudic vessels & nerve, the vessels & nerve to the bulb, Cowper's glands & their ducts.

Clean the erector penis & accelerator urinæ muscles. Notice, by partly removing them from off the crus penis & bulb, how thin they are, and that their apparent bulk is due to their resting upon the subjacent erectile structure.

It will be well to defer cleaning the corpora cavernosa & spongiosum till after the male pelvis is dissected.

II.

FEMORAL & INGUINAL HERNIÆ.

The parts concerned in femoral & inguinal herniæ present a superficial stratum, — skin, superficial fascia with its two layers,

superficial vessels & nerves, lymphatics, and glands, — requiring to be dissected in the usual way before the points of special interest are reached.

In reference to the superficial parts concerned in inguinal hernia, it will, moreover, be convenient to take the coverings of the testicle, and, with them, the testicle, epididymis, & spermatic cord, as a preliminary dissection.

The parts concerned in both herniæ should be dissected first from the front and then from the back. As regards the dissection from the back, both herniæ should be taken together.

(A.)

FEMORAL HERNIA.

(DISSECTION FROM THE FRONT.)

The cribriform fascia can scarcely be differentiated from the deep layer of the superficial fascia. But the saphenous opening in the fascia lata should be distinctly made out as follows:—

Trace up the internal saphenous vein, cleaning its *under surface* very carefully where it dips down to join the femoral. The blade of the knife should not be used here, but merely the flat of the knife, or forceps.

By lifting up the vein, the lower boundary, or inferior cornu, of the saphenous opening should now appear quite plainly, — sharp and well defined.

The inner boundary, the more distinct of the two lateral boundaries, especially in its lower half, should now be traced upwards and outwards as it passes up behind the femoral sheath to become attached to the ilio-pectineal line.

The outer boundary is far less distinct, except in strong muscular subjects. It must be traced with great care upwards and inwards in front of the femoral sheath towards the anterior superior spine of the pubes, to which it is attached. In tracing it, the knife should scarcely be used.

The saphenous opening being made out, no real difficulty presents with reference to the femoral sheath and canal. The three compartments of the sheath can be opened by vertical incisions without interfering with the saphenous opening. Any division of the fascia lata intended to facilitate access to the deeper structures would greatly damage the part for future study. When there happens to be a lymphatic gland in the femoral canal, the dissection of this compartment of the sheath is of course facilitated.

For the dissection from behind, see page 113.

(B.)

COVERINGS OF THE TESTICLE; TESTICLE, EPIDIDYMIS, & SPERMATIC CORD.

One single incision from the external abdominal ring to the bottom of the scrotum is all that is required to demonstrate

the coverings of the testicle & spermatic cord. This incision should be deepened a short distance below the external abdominal ring till the dark and closely-set fibres of the cremaster muscle are distinctly seen (lower down, these fibres are paler and much more scattered). The dissection can then be completed with the finger: the skin, what there is of the superficial fascia, and the dartos will easily peel off; and the deeper coverings and visceral structures will shell out.

Notice the gradual transition from the superficial fascia of the surrounding regions to the dartos; examine the septum scroti and the several successive coverings; open up the tunica vaginalis.

Remove the coverings from off the spermatic cord, separate its component parts, and isolate more particularly the thick and cord-like vas deferens, which lies at the back. Trace the vas deferens downwards along the lower two-thirds of the posterior border of the testicle internally to the epididymis. Try to find the vas aberrans.

(C.)

INGUINAL HERNIA.

(DISSECTION FROM THE FRONT.)

Carefully preserve the thin intercolumnar fascia as it passes down from the external abdominal ring upon the funicular portion of the cord. The ring should not be opened.

Notice the intercolumnar fibres, with which the intercolumnar

fascia is continuous. They cross the fibres of the external oblique, and bind together the two pillars of the ring. Note how the outer pillar blends with Poupart's ligament, and how the inner pillar decussates with its fellow in front of the symphysis.

Make out the ilio-inguinal nerve as it emerges from the external abdominal ring.

Divide the aponeurosis of the external oblique along a horizontal line drawn through the antero-superior spine of the ilium, or, better, a little higher. Again divide it downwards, close to the outer border of the rectus, to within a short distance of the external abdominal ring. Reflect the piece of fascia, and thus show the lower part of the inguinal portion of the spermatic cord, with the lower arched fibres of the internal oblique—(the corresponding fibres of the transversalis may probably be made out already to some extent)—arching over the spermatic cord from before backwards & inwards and becoming tendinous inferiorly. The ilio-inguinal nerve will be seen lying in front of the cord.

Similarly divide the internal oblique, and separate it from the transversalis. The separation will be found easy superiorly, but more and more difficult below. More of the inguinal portion of the cord will now be apparent; the conjoint tendon of the internal oblique & transversalis will be distinctly seen, and so will also Poupart's ligament as it forms the floor of the inguinal canal. The four boundaries or walls of the canal will thus be made plain; and it will be seen how it is that both the internal

& the external oblique muscles enter into the formation of the anterior wall, of the roof, and of the posterior wall of the canal.

Nothing more should be attempted from the front. As it stands, the dissection can be kept, and will be useful for re-examination and study at any time; but, if anything more is done to it, it will be spoilt.

(D.)

DISSECTION OF BOTH HERNIÆ FROM BEHIND.

Now examine the structures from the back on the other side of the body.

The abdominal wall should be divided in the middle line, and again transversely above the antero-superior spine of the ilium, – so that the posterior aspect of the part may be got at.

Examine the peritoneal surface, and make out the internal & external inguinal fossæ, and the projection of the deep epigastric and obliterated hypogastric vessels, which separates them.

Now remove the peritoneum. Clean more particularly the deep epigastric artery and its branches; note its communicating branch to the obturator; and, if there exist an abnormal

obturator artery, particularly note its course with reference to the femoral ring and Gimbernat's ligament.

Clean the fascia transversalis; define the internal abdominal ring; note how the fascia transversalis descends into the inguinal canal to form the infundibuliform fascia and the fascia propria.

Note the sudden divergence of the elements of the spermatic cord;— how the vas deferens (or the round ligament) winds round the deep epigastric artery to descend into the pelvis; how the spermatic vessels & nerves ascend towards the upper part of the abdomen.

Clean the posterior aspect of Poupart's and Gimbernat's ligaments, the sharp edge of which latter should be quite familiar to the surgeon, and define the femoral ring. Clean the external iliac artery & vein, and note how the fascia transversalis passes beneath Poupart's ligament into the thigh to form the anterior wall of the femoral sheath and canal; and how the iliac fascia passes down behind the femoral vessels to form the posterior wall of the same.

III.

MALE PELVIS & GENITO-URINARY ORGANS.

Of all the parts of the body, none are more important than these, both from an examinational, and from a practical surgical

standpoint. Unfortunately they are much neglected by the dissector, for the reason, probably, that the principal structures—those contained within the pelvis—are somewhat difficult to get at.

The classical way of getting at these structures is by making a “side view of the pelvis,” *quod vide*.

This preliminary operation damages, however, the abdomen, and the structures of the brim of the pelvis on one side; and, though extremely helpful, it is really not necessary, provided one small practical point be attended to, namely, that of adequately separating the bladder, prostate, and membranous portion of the urethra from the rectum.

HOW TO SEPARATE THE BLADDER, PROSTATE, AND MEMBRANOUS PORTION OF THE URETHRA FROM THE RECTUM, - THE PERINÆUM HAVING BEEN PREVIOUSLY DISSECTED.

Remove the posterior part of the superficial muscles of the perinæum, and separate the sphincter ani from the central tendinous point.

Now with the finger work up your way between the prostate and the rectum, carefully separating these organs, which are joined together by only a little loose cellular tissue.

Divide the peritoneum of the recto-vesical pouch, and carefully separate the bladder from the rectum.

If the side view of the pelvis is made, it will still be an essential point to separate early the bladder, prostate, and membranous portion of the urethra from the rectum, though in this case the separation may be effected piecemeal rather than as a preliminary operation.

The only structures of the pelvis at all difficult to clean are the vesiculæ seminales, with the adjacent terminal portion

of the vasa deferentia, and the membranous portion of the urethra. These structures are soft, and easily torn if it is attempted to clean them without the advantage of good and easy access. This advantage is now gained.

The rectum, if previously distended, should be temporarily emptied during the cleaning of the organs of the front part of the pelvis, unless the side view of the pelvis be made.

Find the vasa deferentia as they emerge from the internal abdominal rings, trace them downwards to the base of the bladder (which should be *slightly* distended with air), and look for the vesiculæ seminales, which lie on their outer side. Handle these structures carefully.

The ureters are good guides to the posterior extremity of the vesiculæ; be careful of these ducts.

Remove the peritoneum from off the back & sides of the bladder, and the abundant loose cellular tissue which surrounds the organ, being careful of the superior vesical arteries and of the urachus.

Clean the undivided portion of the pelvic fascia, its rectovesical layer, the white line, & the pubo-prostatic ligaments. Note the groove between the latter, which contains the dorsal vein of the penis.

Separate the rectum from the loose cellular tissue between it and the pyriformis muscle and sacral plexus, and clean

the internal iliac arteries and their branches, the middle hæmorrhoidal arteries excepted.

Distend, or re-distend, the rectum with tow, and clean it, with the three sets of hæmorrhoidal arteries.

Carefully remove all but the front part of the recto-vesical fascia, and clean the upper surface of the levator ani. The muscle is a thin one, and, as it has already been cleaned on its under surface, be careful not to perforate it.

Clean the sides of the prostate, noticing the venous plexus surrounding the organ.

Now, starting from the perinæum, clean the bulb of the urethra, with Cowper's glands & their ducts.

Remove the compressor urethræ and deep transversus perinæi muscles, and clean the membranous portion of the urethra, which should be distended with a soft catheter; remove the deep layer of the deep perinæal fascia.

Clean the corpora cavernosa & spongiosum, — these being first injected with wax.

Do not spoil the dissected pelvis to get a view of the interior of the bladder & urethra. Separate parts will be supplied for this purpose.

ADDENDUM.

There is another way of coming upon the trunk of the facial nerve, which the less venturesome dissector may perhaps prefer to the one given on page 12. While the temporo-facial branch of the facial nerve crosses in the parotid both the arterial & the venous trunk, the cervico-facial branch crosses the arterial trunk only, and passes beneath the corresponding vein. Hence the dissector may trace up into the parotid both the external jugular vein, and its large anterior branch of origin, – the internal maxillary, – not only without danger to the facial nerve, but with the certainty of finding the cervico-facial branch of the nerve close to, and just beneath, the vein. The cervico-facial branch, once found, will soon lead up to the parent trunk. The dissector must of course be careful *not* to trace the *posterior* branch of origin of the external jugular vein, – the temporal vein, – till after the temporo-cervical branch has been found; otherwise this would necessarily be divided.



